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The Physics and Biology of the New Intensive Deep Therapy*

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WITHIN the last few years there has been a marked advance in the field of deep therapy. The researches of men like Dessauer, Friedrich, Voltz Seitz and Wintz led to the development of apparatus capable of delivering such a high voltage to the tube, that the rays produced are of wave lengths so short that they are nearly approaching the γ ray of radium in their power of penetration. The development of the Coolidge tube made possible the employment of such high voltages. The new short wave roentgen therapy has the advantage over radium in the comparative cheapness of the instrumentarium. Even with large quantities of radium placed directly on the skin and with all the possible thickness of filters it is not possible to get homogeneous radiation on account of the physical law that intensity varies inversely as the square of the distance from the focus of radiation. Only extremely large quantities, many gram-hours, placed at a considerable distance from the skin could accomplish this at a prohibitive outlay and cost.

PRODUCTION OF THE RAYS

The gas tube is now but rarely used in deep therapy and the subject can be dismissed after merely mentioning it. The production of rays in the gasless or Coolidge tube is due to the presence of free electrons in the molecule of the metal of the cathode. When heat is applied to it, the molecules of its metal expand and the electrons move and collect on the surface, where they remain until a high frequency current is applied to the tube. The electricity flows from cathode to anode. The electrons, because they carry the

same electric charge as the cathode are repelled and begin to move toward the anticathode which is the same as the anode. The rapidity of the movement of the electrons depends upon the difference of potential between the two poles, the voltage applied. When the electrons strike the anticathode, x-rays are produced. These are electromagnetic waves of certain lengths, ranging from 1.0 to 0.1 angstrom units. The shorter the wave length of a given ray the harder it is said to be, i. e. the more capable it is of penetrating a certain substance without being absorbed by it. The more rapidly moving electrons produce x-rays of shorter wave lengths and greater penetrating power.

ABSORPTION OF ROENTGEN RAYS. FILTRATION

When a bundle of rays emerge from an x-ray tube, it is composed of units of varying wave-lengths. Some are so long that they can be absorbed by the thinnest sheet of paper, while others are so short that they can penetrate a layer of lead one inch in thickness. It is highly probable that rays which vary from each other in wave-lengths, also differ in their action upon the cells of the plant and animal. This is similar to the difference in action by the infrared, red, blue, violet, and ultraviolet rays of the sun. It is interesting to note here that there is a greater difference in wave-length between the various x-rays than there is between the various colors of light in the visible and invisible spectrum. The difference in wave-length between infrared, the visible spectrum, and the ultraviolet light is only one to two

octaves, while in the x-ray spectrum twelve octaves are already known.

Roentgen rays upon absorption, bring forth secondary radiations which are electrons. Their rapidity of motion is taken from the rays producing them. This rapidity and hence the distance which these electrons can reach grows rapidly with the increase of the voltage. If we take the rays of the shortest and longest wave lengths used in x-ray, namely 0.1 and 1 Angstrom Unit we will find that the electrons produced by the shorter rays will travel 3.15 times as fast as those of the longer wave length and they will reach a distance 31.5 times as great. By producing secondary electrons they will saturate an area 30,000 times as great as the first. Hence the rays become scattered over an enormously larger area. The difference between the soft and hard rays can be compared to the difference between a concentrated and a diluted drug. The former acts as a caustic, destroying everything that comes in its way, the latter has a selective action on the more susceptible cells and leaves intact those that are less so. This would seem to bear out the contention that not all x-rays are alike in their action, that modern short wave-length therapy is superior to the old method because the rays are more nearly uniform and they approach the γ rays or radium in power of penetration.

In deep therapy, the object is to obtain a bundle of rays of as nearly homogeneous composition as is possible; to make it clear, the object is to obtain a cone of rays, the individual components of which differ as little as possible from each other in wave-length, all possessing approxi-

mately the same hardness or power of penetration. The latter must be sufficient to penetrate at least ten centimeters of tissue in sufficient quantities to produce the desired effect. This is accomplished primarily by starting with a highly penetrating bundle of rays from an apparatus working under high voltage. This, however, is not sufficient. With the use of unfiltered rays, on account of the diverse composition of the bundle, it is impossible to estimate the physical and biological dose, because the absorption in each succeeding layer is different not only in quantity, but also in quality. The superficial layers absorb the soft rays, the medium layers absorb the rays of medium hardness, and only the hardest rays penetrate the deep structures. To further improve the quality of the radiation, the soft rays must be eliminated and this is done by means of metallic filters. The latter are interposed in the path of the rays in such thicknesses that practical homogeneity is obtained. In other words, the quality of the rays which remain after filtration are such, that each succeeding centimeter of tissue absorbs approximately the same percentage. Absolute physiological homogeneity like monochromatic light is at present impossible to obtain. The filter, however, absorbs not only the soft rays, but a proportion of the useful hard rays and, therefore, the intensity of the rays which emerge from the filter is small in comparison with that issuing from the tube. Consequently the time consumed by the application of a skin dose (the amount of rays necessary to produce a slight erythema of the skin), is, of necessity, so much longer. From experience, it has been found that 0.5 mm. copper to which has been added 2 mm. of aluminum to cut out the secondary rays produced by the copper, will permit the passage of a bundle of rays which are homogeneous enough for practical purposes. With this filter in place, the time consumed by the application of a skin dose may be fifteen times as long as that consumed by the unfiltered rays. This is true when we work with rays of medium hardness. With rays of different qualities, this ratio may become smaller or greater. The following will illustrate the influence of filtration upon the mixture of rays as it emerges from the tube. If we take three different qualities of rays, soft as used in diagnosis, hard about 160 kilovolts, and very hard—about 220 kilovolts, and allow each to pass through a filter of aluminum 5 mm.

in thickness, we will find that only 4 per cent of the first will pass the filter, 60 per cent of the second and 80 per cent of the third. If the filter is doubled, 0.16 per cent of the first, 36 per cent of the second, and 64 per cent of the third will pass it. If 15 mm. of aluminum is used which gives approximately the same filtration as 0.5 mm. copper with 2 or 3 mm. of aluminum, the values will be reduced to 0.064, 21.6, and 51.2 per cent respectively. With the increase of voltage, there is an increased production of rays. Furthermore, they are more penetrating and larger quantities pass the filter and are utilized. Dessauer showed that if we employ a current of 175 kilovolts on the tube terminals, and a filter of 0.5 mm. of copper, and this delivers a skin unit of rays in a certain specified time with a certain milliamperage, then 100 kv. and only 0.25 mm. copper will deliver 30 per cent of that unit; 120 kv. and 0.3 mm. copper—45 per cent; 150 kv. and 0.45 mm. copper—63 per cent, while 205 kv. and 0.8 mm. copper will deliver 112 per cent of the skin unit, provided that the amperage and the time factor are the same. All this takes place in spite of the fact that the harder rays can penetrate the skin in larger quantities without being absorbed by it and without causing its injury.

LOSS BY DISTANCE

The quantity of rays passing the filter suffers a further loss by distance from the source of the rays to the object they are to act upon and also by absorption in the superimposed layers.

Law of distance: The intensity of the rays striking a certain surface varies inversely as the square of the distance from the source of the rays,

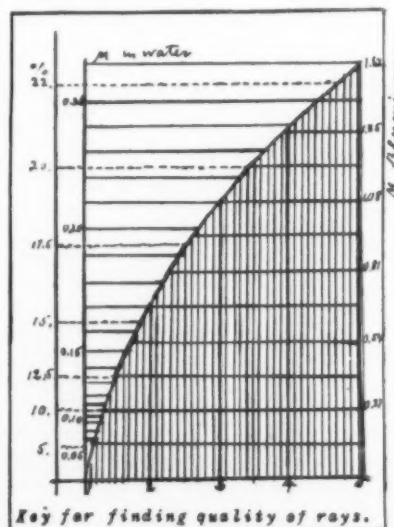


FIG. I

in the same manner as light. Its intensity will be reduced to one quarter when its distance is doubled. If we take for an example a tumor which is situated ten centimeters deep, and we place the focus of the x-ray tube ten centimeters above the surface of the skin, we know that the rays which have reached the skin have suffered a certain amount of loss by distance, but the bundle of rays which reaches the tumor, ten centimeters deep, will be reduced in intensity to one quarter of that still present at the surface, because its distance is just doubled. If we place the focus of the tube fifty centimeters from the skin, the bundle of rays reaching it suffers an enormously greater loss in intensity than in the previous case, but of these rays about seventy per cent will penetrate the desired depth of ten centimeters. The loss of intensity at the surface can be made up by increasing the time proportionately, while the deep dose becomes very much better. This factor is advantageously utilized in the new intensive deep therapy. By placing the tube focus at fifty, sixty and even seventy centimeters from the tube we bring down the loss by distance to a minimum.

Formula:

$$\frac{\text{Square of distance to skin}}{\text{Square of distance to tumor}} = \text{Intensity at tumor in percentage of surface intensity.}$$

Translated into figures we have in the first instance, $10^2 : 20^2 = 100 : 400 = 25\%$ of surface intensity; in the second instance $50^2 : 60^2 = 2500 : 3600 = 70\%$ of surface intensity.

LOSS BY ABSORPTION

As stated above, x-rays are capable of absorption by any medium they are made to pass. The amount of absorption depends upon the quality of the rays, the density of the absorbing medium, and its thickness. The shorter the wave-length of a given bundle of rays the less of it will be absorbed by the substance through which it is made to pass. The softer rays will be absorbed by the uppermost layers of the tissues under fire, while the harder ones will penetrate much deeper. In the new intensive deep therapy, the hardest possible rays are used from the outset. The thicker the medium through which the rays pass the more of them will be absorbed. It follows that a deep seated structure will receive a smaller percentage of the energy present at the surface than will the more superficially situated layers, because the total energy is continually diminish-

ing as the rays reach the deeper structures. The amount of absorption is directly proportional to the density of the absorbing medium. Copper, for example, absorbs twenty-five times as much of the rays as does aluminum. In the body, the absorption by bone on account of its calcium content is greater than by the soft structures. The lungs and the hollow viscera absorb less rays on account of their air content. These organs, therefore, respond poorly to roentgen therapy. As the density of the tissues of the body does not differ much from that of water, the latter is used as a substitute for measuring the degree of absorption outside of the body. Other substances used with advantage are beeswax and paraffin.

INCREASE IN INTENSITY. SECONDARY RADIATION.

There are three kinds of secondary radiations. (1) The characteristic rays which are peculiar to the substance in which they are excited. Every substance when it is acted upon by the roentgen rays is capable of calling forth these radiations. The quality and penetrative power of these rays depends directly upon the density of the substance in which they are produced. (2) Secondary corpuscular rays. These are moving electrons. The rapidity of their motion and hence their penetration is derived from the rays which produce them. The shorter the wave length of the original ray, the more rapidly moving electrons will it produce. It is probable that most, if not all the biological action of the roentgen rays is due to these rays. (3) When a cone of rays strikes an absorbing medium a certain number of its components are deviated from their normal path. They become scattered as do the sun rays on passing opalescent glass. As these scattered rays reach a certain depth, they reenter the center of the field and add to the intensity of the rays that have traveled the straight path. The deeper the layer traversed by the rays the larger is the addition from this source. They are also directly proportionate to the density of the tissues they are made to pass. The size of the field upon which the rays act plays a great part in increasing the amount of secondary radiation. The greater this port of entry the denser the tissues, and the deeper the object which we desire to influence is situated, the greater will be the addition from secondary radiation, and vice versa. When a greater thickness of tissue is treated even the superficial layers receive a greater

amount of secondary radiation. If we apply a certain quantity of rays to the hand, which is about two centimeters in thickness, the intensity of the rays at its lower surface after traversing the entire thickness will be smaller than if the same quantity and quality of rays are applied to a structure of much greater thickness, let us say the chest, taking a measurement two centimeters deep. In the second instance there are secondary radiations added from below, while in the first this is not the case. In the same manner the hand would receive a larger quantity of rays than the thumb, if applied simultaneously on account of the greater portal of entry in the former case. In treating a small surface tumor, if the surrounding skin is protected by lead rubber, double the erythema dose may be given without causing injury to the exposed skin.

The following examples illustrate the addition from secondary radiation. When the most penetrating rays that are possible to be produced with our present instrumentarium are employed μ water 0.140, about 12.5 per cent diminution of intensity per centimeter of water, 200 kv. on the tube terminals, and a filter of 1.3 mm. copper + 1 mm. aluminum), and the tube focus is kept at a distance of 30 cm. from the skin, the calculated physical dose 10 cm. below the surface is 14 per cent. The dose at that depth found by actual measurement, however, with the smallest port of entry, 6 by 8 centimeters, is 23 per cent, while the largest field, 18 by 24 centimeters, it is 47 per cent of the intensity present on the surface, more than three times the dose obtained by mathematical calculation. When rays of medium penetration are employed μ water 0.166, 162.5 kv. and a filter of 0.5 mm. copper + 1 mm. aluminum), with a field of 18 by 24 cm., the calculated dose 10 cm. deep is 10.7 per cent and at a depth of 19 cm. it is 1.6 per cent, while the actually measured dose is 30 per cent and 8 per cent respectively, 2.8 and 5 times as much.

HOMOGENEOUS DISTRIBUTION.

To obtain the best results in treating diseases by roentgen rays, it is necessary to have as uniform a distribution of the rays within the structures to be treated as is possible, a bathing as it were, of the parts with rays nearly equal to each other in physical and biologic properties, and the intensity must be approximately the same for each cubic centimeter of tissue under fire. With the modern method of deep therapy, utilizing

only the short wave-length rays and taking cognizance of the influence upon the deep dose of the distance from focus to skin, of the relation between the latter and the distance from the skin to the object which we desire to influence therapeutically, the depth of the lesion with regard to absorption in the superimposed layers, and the size of the port of entry, homogeneity is, in a measure, obtained. However, this holds good only when the lesion to be treated is situated underneath an even surface, as the male chest for example. If we wish to treat a carcinoma of the female breast and desire to include all the regional glands in one field, the problem of producing a saturation of all tissues under consideration with rays of uniform quality and quantity is not so simple. In this case all our physical laws become distorted by the great irregularity of surface, the various portions of which differ in distance from the focus by several centimeters. The result, naturally, is a marked difference in the deep dose in the various portions of the field. Some are liable to receive a dose greater than the lethal dose for cancer, while others may receive a smaller one. In the treatment of this disease it is well established that if the rays are not powerful enough to cause the destruction of the cancer cell they are apt to cause its stimulation. In this manner it may happen that we may over-treat certain regions with resulting necrosis and absorption into the system of its toxic products or, if this is not the case, we may undertreat other regions with resulting stimulation of the growth of the cancer. It is apparent that this error in deep therapy might be obviated if we could by some arrangement change the irregularity into an even surface and, at the same time, place the areas we desire to influence at a uniform depth. Of late, this has actually been done by placing over the uneven surface to be treated objects which have the same absorbing power as the tissues of the body. Very thin rubber bags which are filled with water are used or the uneven surface can be moulded into a plane by means of soft wax or paraffin. The method employed by the author is to melt two parts of paraffin with one of white wax. This mixture is poured into a vessel containing cool water. It is then of the consistency to be moulded into any shape. This malleable mass is applied over the surface in such manner that there is about two centimeters of it over the most prominent parts and as many centimeters more over the other re-

gions as will produce an even surface. The scheme is further carried out by applying the same process to the back, including the adducted arm and taking care that the anterior and posterior surfaces of the mould are parallel. Whatever scheme of treatment we now select in order to get the deep dose, we have the advantage of uniformity of surface and depth of the region to be treated. A further advantage of this method is the absolute safety to the skin which is covered with 2 cm. of absorbing medium.

In treating cancer of the tongue, the rays must pass an air space before they reach that organ. On account of the difference in the density of the medium through which the rays pass, there is a lack of uniformity of distribution and there is also a smaller amount of secondary radiation. That probably accounts for the poor results obtained by x-ray therapy in cases of carcinoma of the tongue. Dessauer suggests that this difficulty might be overcome by filling the mouth with some substance which has the same density as the tissues of the body, such as oatmeal gruel and similar pastes. Other body cavities like the rectum and vagina may be packed with water soaked sponges. The bladder may be filled with fluid before the rays are applied to it.

As substances possessing a higher density produce a greater number of secondary radiations some workers in treating the bladder, recommend filling it with some salt of a heavy metal, argyrol for example. Similar substances have been injected into the tumor mass itself and, according to some observers, with decided improvement over the ordinary technique.

The blood, on account of its iron content, produces a greater number of secondary radiations. This is the reason why a hyperemic organ is more susceptible to the rays than is an anemic one. It is well known that the skin of patients with hyperthyroidism has an increased susceptibility to radiation. This is owing to the vasomotor irritability and increased blood supply to the latter organ. There is no direct relation, however, between the amount of absorbed energy and the physiological dose and it is not always the case that tissues of greater absorbing power are more susceptible to the rays. Bone, for example, has a greater absorbing power and its susceptibility to the rays is smaller than that of the soft tissues. In general, the difference in absorbing power between the various tissues is neglected

and, whatever there is of it, is taken account of under the heading of general tissue susceptibility.

PHYSICAL LAWS GOVERNING THE MEASUREMENT OF X-RAY DOSE

The plant and animal cell undergoes certain changes under the influence of roentgen rays. The kind and the amount of these changes depends upon the physiological properties of the cell itself and also upon the quantity and quality of the rays employed. It is easy to see that if we have means of reproducing the exact kind and amount of rays we can also reproduce their action upon the cell as the properties of the latter are more or less constant and, if they vary, they do so under fairly well defined conditions. The former is called the physical dose, the latter, the biological.

As the rays act primarily on a volume of tissue through which they travel, the action on the general economy being secondary, we speak of the physical dose as a local force, because there are specific changes in the cells which lie in their path. For that reason, it becomes necessary to know this local zone, its size and the distribution of the force within it.

Different qualities of rays produce effects upon the cell which differ in intensity and likely also in kind.

It is not established that only the rays which are absorbed by the tis-

sues exert a biological action upon the cell. It is quite possible that a catalytic action may be ascribed to the passing rays which are not absorbed.

For the above reasons the physical dose defined by Christen, namely, the quantity of rays absorbed per unit of space, no longer answers the purpose. It should be defined as the quantity of rays of a certain quality present in a unit of space during a unit of time.

To have an exact idea of the dose we must have a clear knowledge of the following factors: The quality or hardness, the quantity, the distribution of the rays in each cubic centimeter of tissue under fire, and the method of field selection.

THE QUALITY

This can be expressed in different terms: (a) the average wave frequency, (b) the average wave-length, (c) the width of the spectrum and the position of the spectral lines, (d) the thickness of a layer of substance (water or aluminum), which will absorb half the quantity of rays, and (e) the absorption coefficient or the percentage absorption per centimeter of water. As the latter measurement also includes the loss by dispersion, it is more proper to use the term weakening coefficient and percentage diminution of intensity per centimeter of water. Of all these expres-

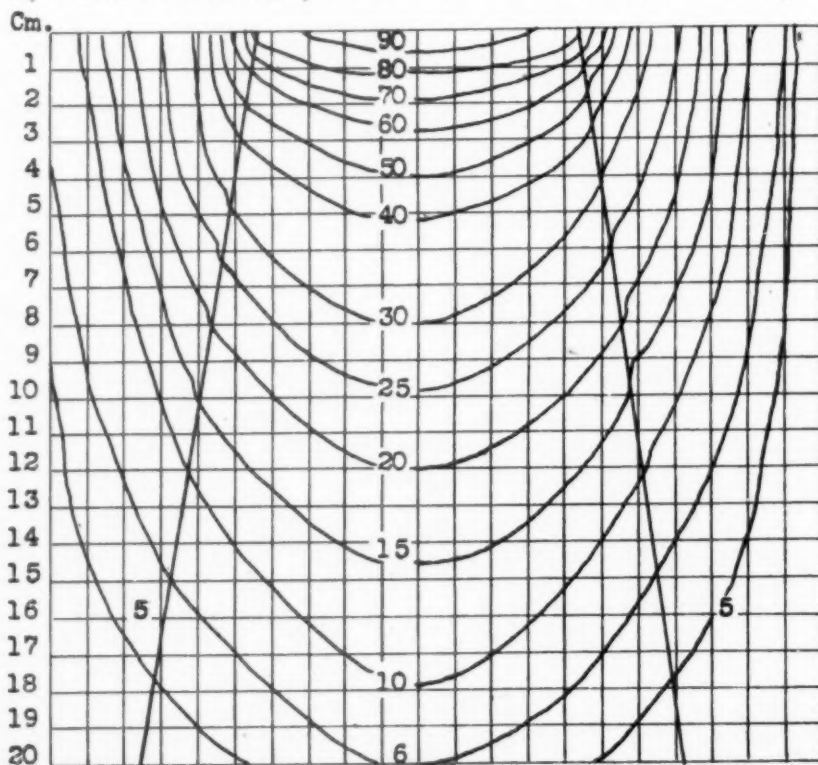


FIG. 2

Fig. II—Water O. 166 μ 162 kv.; o. 5 mm. Cu + 1 mm. Al; 30 cm. f. s. distance; field 9x12 cm.

sions of quality, it is the last one that is in general use, the others having a greater value to the physicist than to the practical roentgen therapist. It is not necessary to measure and ascertain the diminution coefficient before every treatment. Once established on a given apparatus the quality will remain the same for a long time unless some disturbance in the workings of the instrumentarium takes place. In daily practice it is controlled by the parallel spark gap or by a voltmeter graduated to correspond to the readings of the gap and by the filter. As long as the same conditions are reproduced, the quality will remain the same. Only, from time to time, a control measurement is made.

QUANTITY

In this measurement we are not concerned with the amount of rays emanating from the tube, but with the amount present on the surface after they have passed the proper filter. When this quantity is known, it is easy to calculate what percentage of this surface intensity is present in the deeper layers throughout the region effected by the rays. It can be defined as the energy present per square centimeter of surface multiplied by the time during which it has been applied. It is the same as

milliamperage multiplied by time. As the surface energy is influenced by the distance of that surface from the source of the rays, it follows that the product of the milliamperage by the time divided by the square of the distance constitutes the surface dose.

$$\frac{\text{Milliamperage} \times \text{time}}{\text{Distance}^2}$$

This formula must always remain equal. If we increase the milliamperage, we must diminish the time or increase the distance. If we increase the distance we must also increase the time or the milliamperage proportionately to its square.

The deep dose is expressed in percentages of surface intensity. (Milliamperage \times time). If we assume that the surface intensity is 100 per cent, we say that at a certain depth there is a certain per cent of that energy. In order to ascertain the deep dose we must know what is the superficial dose and for this there is no actual way of measuring. The skin unit has been established by the various clinics and even this lacks uniformity. It varies from the energy consumed in producing a slight erythema on the skin in from one to two weeks and ending in four weeks in a mild pigmentation to the maximum erythema (Friedrich) just short of a first degree burn. The lat-

ter is a dangerous procedure for the average clinician, although the writer has seen twice the erythema dose applied to the skin without causing a burn, and in other instances severe reactions produced by the ordinary hitherto considered safe skin unit. There is no way of establishing an absolute quantity for the erythema dose and there is no way of ascertaining even this relative quantity except from actual experience on the patient with each individual instrumentarium or by comparing quantities with an apparatus on which the time consumed by the erythema dose is already known. With all measuring apparatus, however, quantities can only be compared when the quality of the rays is the same. If the hardness of the rays differs, the measuring instrument may read more or less than the actual quantity present. In the Fuerstenau intensimeter, this error is inherent in the selenium. In the iontoquantimeter, this is due to the metal ionizing chamber, because, in this, harder rays ionize more air than softer ones. There is one instrument, however, the Friedrich iontoquantimeter, the ionizing chamber of which is constructed of horn and graphite. The latter substances have nearly the same atomic weight as the tissues of the body and, therefore, the instrument measures

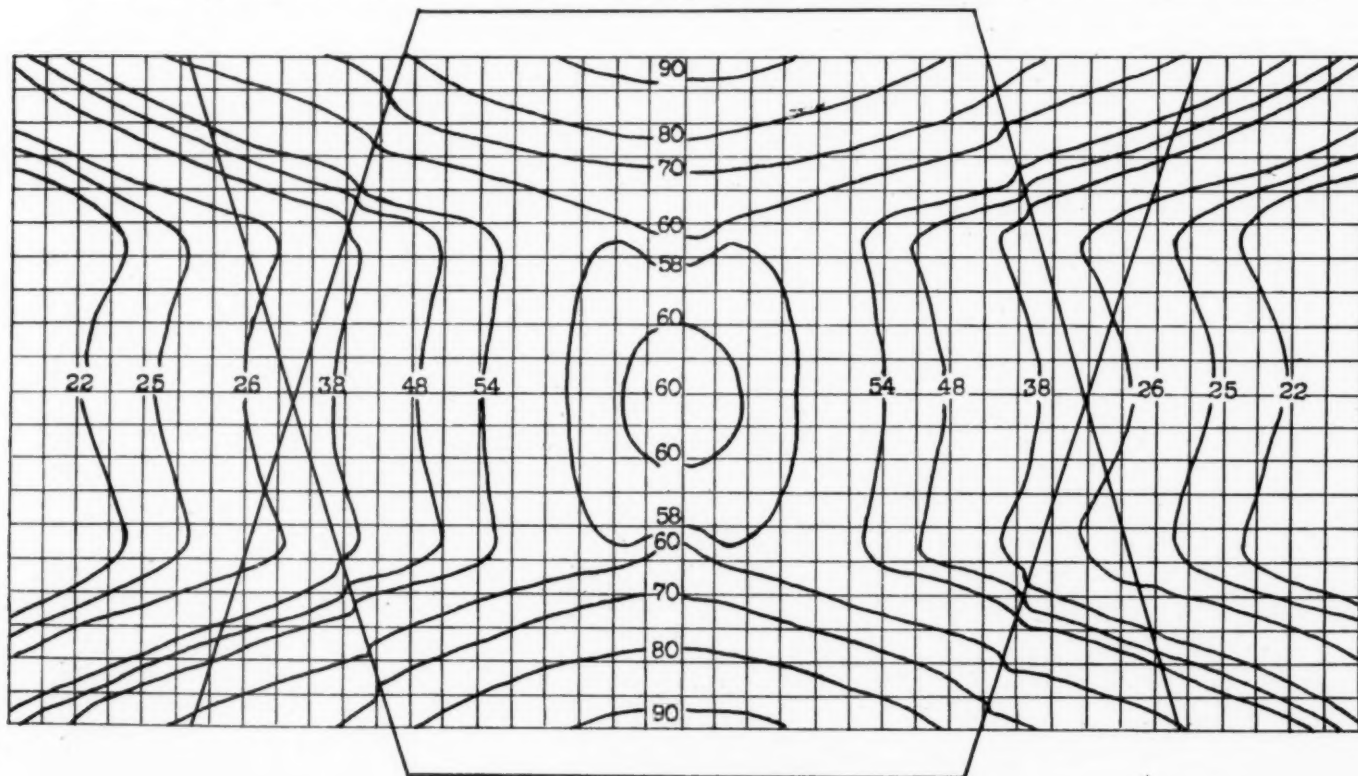


FIG. 3

Fig. III—Showing the distribution of the rays when two fields are crossed, one front and one rear field. Anteroposterior diameter of the body is 20 cm.; μ water 0.166; 162 kv.; f. s. distance 30 cm.; o. 5 mm. Cu + 1 mm. Al; field 18x24 cm.

quantity nearly independently of voltage. Friedrich measured the erythema dose in actual electrostatic units and established it as 170 "e." His apparatus is arranged so that each space on the dial of the electroscope represents exactly one e., there being ten spaces on the dial. The result is that the time consumed in discharging the ten spaces multiplied by seventeen represents the erythema dose. By introducing the ionizing chamber into a body cavity as the rectum or vagina, the actual deep dose can be ascertained. The dose once established is controlled by the milliamperemeter and the time.

PRACTICAL MEASURING OF DOSAGE

There are several ways of measuring the deep dose of roentgen rays. The one described by Voltz rests upon the ascertaining of the percentile deep dose. This is defined as the per cent of surface intensity still present 10 cm. deep, when the focus skin distance is 23 cm. and the field is 6 by 8 cm. Corrections for greater focal distances and larger ports of entry are read off from prepared tables. The measuring is accomplished by means of an iontoquantimeter, the ionizing chamber of which is placed on a block of wax to reproduce the secondary radiations occurring from below, as is the case of the body. The tube focus is placed at 23 cm. from the ionizing chamber, the field is 6 by 8 cm. and a filter of 0.5 mm. copper and 1 or 2 mm. aluminum is interposed. A reading is taken and the time that it takes to discharge the ten spaces on the dial of the electroscope is noted. Let us say that in this case it takes 11.5 seconds. The

1000
formula for this reading is $D_0 = \frac{1000}{t}$,

in which D_0 is the surface intensity and t is the time. Substituting 11.5 for t , we have $D_0 = 87.6$. This is an arbitrary quantity since the 1000 used is also arbitrary. We now place the ionizing chamber 33 centimeters from the focus on the block of wax and interpose a wooden box filled with distilled water between the focus and ionizing chamber. This box is exactly 10 cm. in thickness. A second reading is now taken. Let us say that now it takes 71.5 seconds to discharge the ten spaces on the dial of the iontoquantimeter. Replacing

the t in the formula $D_1 = \frac{1000}{t}$ in

which D_1 equals the intensity 10 cm. deep, we have $D_1 = 14$.

D_1 14

$\frac{14}{87.6} = 16$ per cent, the percentile
 D_0 87.6

114

deep dose. This being established, the additions for greater focal distances and larger fields are made from a series of tables prepared by Voltz (Dosierungs Tafeln fuer die Roentgentherapie). If we wish to improve our deep dose beyond that which we obtain by direct measuring, we proceed to increase the port of entry from 48, let us say to 150 centimeters. All we have to do in this case is to refer to a table which tells us that under the changed condition it is 22 per cent. If we wish to further improve it by increasing the focus skin distance, let us say, to 50 centimeters, we turn to another table which shows that the deep dose is changed to 32.2 per cent or more than double the dose obtained with the original arrangement. This system of measuring, however, is only correct for the center of the field where the central ray passes. To the sides, the intensity is less and there is no way of ascertaining the amount of this variation in intensity with Voltz's tables. It is fully accounted for, however, in the system described by Dessauer.

In the latter system, a large chamber electroscope is used and the rays are admitted by means of a small opening. A constant distance is maintained between the tube focus and the ionizing chamber. A reading is taken after interposing the usual filter (0.5 mm. Cu + 2 mm. Al), and the time it takes to discharge the ten spaces on the dial is noted. This quantity is denoted as J_1 . Now a measuring filter is added. This consists of a softer material than the original filter in order not to further change the composition of the rays. Ten millimeters of aluminum are used. A second reading is now taken and the result obtained is denoted as J_2 . Let us assume that it takes ten seconds with the original filter and twenty seconds when the measuring filter is added. We then have $J_1 = 1/10$ and $J_2 = 1/20$, the second intensity being 50 per cent of the first. This means that the first centimeter of aluminum absorbs 50 per cent of the rays, the second 50 per cent of what is left, etc. This is the diminution coefficient in aluminum which is not used to denote the quality of the rays. The reason for this is that a millimeter of aluminum absorbs as many rays as one centimeter of water only when soft rays are used. With the increase of the hardness of the rays this relation varies and, therefore, the diminution coefficient μ in water has to be found. As this is a difficult mathematical problem, Dessauer prepared a chart (see below), from which the

absorption coefficient in water and the percentage diminution of intensity per centimeter of water can be read off directly. By dividing J_2 by J_1 we get the numeral 2. Turning to the bottom of the chart, we search for this numeral. A vertical line opposite this connects with a horizontal line which points to the diminution coefficient μ water 0.17 and a diminution per centimeter of water of 16 per cent. (Chart I.)

MEASURING OF HOMOGENEITY OF THE RAYS

The homogeneity of the rays can be determined by adding a second measuring filter of 10 mm. Al. A third reading is taken and the quantity is denoted as J_3 . Let us assume that this time it takes 38 seconds to discharge the ten spaces. For the

J_2
rays to be homogeneous — must be
 J_1

J_3
equal to—. If the second is smaller
 J_2

than the first the beam of rays has not yet reached the point of homogeneity and we must add to the thickness of the original filter. In this case, the result of the first division is 2, and of the second, 1.9. We can at once see from the chart that the first result indicates an absorption of 16 per cent per centimeter of water and the second 15 per cent. This is not an absolutely homogeneous ray, because its quality is improved on addition of the measuring filter, yet is sufficiently so for practical purposes.

CORRECTION FOR DISTANCE AND PORT OF ENTRY

A series of about 100 charts prepared by Dessauer includes these corrections. They are arranged for four different qualities of rays. After ascertaining the diminution coefficient μ water by direct measurement, we refer to the proper chart which gives us the intensity for every centimeter of tissue under fire, not only in the center of the field, but to the sides as well. (Chart II.)

METHOD OF FIELD SELECTION

In treating a deep seated region, in order to compensate for the loss by absorption in the superimposed layers, it becomes necessary to enter the lesion from several ports of entry. The proper dose at the desired point is then obtained by means of a cross fire system. A mould of the size and shape of the body in the same level where the diseased organ is situated can be made by means of two long strips of lead which are connected by means of a hinge. This

shaped lead "perimeter" is placed on a transparent sheet of paper and a tracing is made with a pencil. By means of anatomical cross section charts, especially prepared for this work, the organ in question is filled in in the drawing. This is placed over the dose chart and as the former is transparent the percentages can be traced and marked on it. A second and a third field can be added until the proper dose is obtained. After this scheme is made up on paper, it can readily be reproduced on the patient. (Chart III.)

THE BIOLOGICAL DOSE

With all these physical measurements we still do not know how large the dose is to be in each particular instance. What per cent of the surface dose must penetrate to the deeper layers in order to obtain the desired effect upon a given tissue? This is the biological dose. Several workers, from experience and observation, have established a specific biologic dose for the various tissues. Taking the skin as a unit, the quantity of rays that will cause a slight erythema of the skin has been called the skin erythema dose. Doses for other tissues have been calculated in percentages of this skin unit. So, according to Wintz, the dose for the ovary and testicle is 31 per cent, for sarcoma it is 60 to 70 per cent, for carcinoma 90 to 110 per cent, etc. These doses, however, must not be regarded as specific because the organism is capable of reacting differently to the same stimulation at different times. For that reason each individual case must be treated as a separate entity.

Individual cells react differently to the same kind and amount of stimulation. The greater the reproducing power, the more rapid its division, the younger and the less differentiated the cell is the more easily will it be influenced by the rays. This susceptibility, however, is specific only during health. With deviation from the normal, the degree of susceptibility also varies and for this variation there is no exact measure. So we have the difference between the normal epithelium and the cancer cell, the fibroblast and the sarcoma cell, the increased susceptibility of the skin by hyperemia and its diminution by anemia, and the diminished resistance of the skin and the increased resistance of the cancer cell from debilitating conditions such as tubercular and cancerous cachexia.

In treating carcinoma with roentgen rays, the fact must constantly be kept in mind that not all patients can tolerate the same amount of rays.

While treating the disease one must be careful not to injure the patient. While it is true that a large dose has a stronger influence upon the cell than a small dose, if carried too far we may injure the structures that carry with them the resistance to body invasion. In cancer and tuberculosis it is the fibrosed areas around the lesions which possess this power. Bashford, Murray, and Cramer have shown that the mouse cancer, after being attacked by x-rays, is destroyed by fibroblastic infiltration. Caspari has advanced the theory that this takes place in the same manner as in healing of a wound. After absorption of roentgen rays, a certain amount of necrosis occurs. The necrotic material is absorbed into the system and produces a distant chemotaxis on the fibroblasts, causing them to proliferate. If too large a dose is given, a great amount of necrotic material is absorbed into the system causing systemic poisoning. That is why patients with large tumors, when treated with massive doses, often succumb rapidly. The reverse of calling forth into action the defensive mechanism of the body takes place. This mechanism is inhibited or destroyed. That body immunity plays a great part in the cure of cancer was shown by Caspari and others. Animal tumors were treated with ten and even one hundred times the erythema dose, and living, normally staining cancer cells were found in the liquid, necrotic mass resulting from the treatment. Of course, the animals succumbed. These experiments could not be repeated on the human being, but it indicates that the patient would succumb to the treatment long before all cancer cells would be directly destroyed by the rays. In spite of the fact that not all cancer cells can be destroyed by x-rays, not even by a lethal dose, there is no doubt that we cure many cancers. Furthermore, many cancers cure themselves, only in most instances this takes place at a stage before a diagnosis is possible.

Dessauer advances a theory of the biologic action of the rays which is in unison with the thoughts advanced by Caspari. The electrons produced when the rays are absorbed by the tissues travel very rapidly and in a zigzag direction. When they form an impact with a cell particle, they produce ions. The latter may recombine, but the ultimate result is heat. Dessauer calls this "punctiform heat." This heat is not enough to raise the general temperature, but acts on the particle in which it is produced. If we assume that the size of the average cell is about one mi-

cron, then a ray of medium hardness will strike about 100 cells. The production of heat causes the electron to lose energy with each impact until it comes to a stop. The application of heat in this case is not uniform and can not be compared to the coagulation of an egg by the elevation of temperature. In this case it is an impact of an electron against an extremely small part of the molecule and, as the cell is composed of numerous such molecules, it requires a large number of such impulses to injure the cell. Not all cells receive the same number of impulses and the same amount of punctiform heat. Some receive sufficient to be destroyed by it, others receive a smaller number so that no visible injury is produced, while a small number of cells may not be struck by the electrons at all and these are the ones that survive even a lethal dose of x-rays. Stimulation by x-rays is explained in the following manner: When all cells receive a small number of impulses, punctiform injury and local necrosis is produced within the cell, but not sufficient in amount to destroy the cell. This necrotic cell material is absorbed into the system, where it acts as stimulant to cell growth.

With these considerations in mind, one may ask whether it is advisable to push x-ray therapy beyond the present limits? Recently we have heard, even in the lay press, of roentgenologists working with 300 kilovolts, of apparatus which is capable of delivering one million volts and which can be utilized to feed ten tubes at a time, and of patients receiving 50 or 60 consecutive hours of treatment. It is true that recent investigations by Dessauer and others show that if we increase the voltage above 200,000, the result is a more penetrating beam of rays. However, the present day x-ray tube can not be run for any length of time with a voltage higher than the one above mentioned. This may be possible in the experimental laboratory, where the tube remains in use for a few minutes at a time. There is very little gained in the quality of the rays by interposing a filter of greater absorbing power than 1.3 mm. copper. Certainly not enough to compensate for the enormous loss in time. This is not simply a futile act, but may in fact do no small amount of harm by lowering the resistance of the patient. Roentgen catarh with its attacks of vomiting which may be of several days duration, and the complete loss of appetite accompanying it, does not add to the resisting power of the patient. In

spite of the fact that the latter is generally attributed to vagus irritation there is no doubt that nitrous oxide and, especially ozone and compounds of ozone which are abundantly present in the air of the x-ray room are responsible for no small amount of this form of intoxication. In fact, treatment has often to be interrupted and occasionally discontinued on account of this evil, sometimes after only a few hours. During the time the patient is under the influence of the rays, his body carries a charge of 3000 to 4000 volts. The continuous charges and dis-

charges of this alternating current cause a disturbance in the electrical equilibrium of the cells with a resulting change in their chemical composition. The destruction of the white blood cells, an extremely important element of body defence, if not the most important, goes hand in hand with the increased amount of radiation and particularly with the increased duration of the treatment. It is regarded by some as being directly proportionate to the number of times the blood circulates through the region under the influence of the rays.

These facts and also the fact that not all patients respond in the same manner and in the same degree to x-ray treatment, and, above all, the fact that not even a lethal dose destroys all the cancer cells would seem to call for a more rational attitude towards our patients. The indication at least for the present is that each individual case should be treated according to its own merits, rather than that we should strive for larger apparatus and for longer hours of treatment.

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The Diagnosis of Ureteral and Renal Calculi

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FOLLOWING the advent of the roentgenographic instruments many radiopaque substances were found in the abdominal region, but it was not until the cystoscopic examinations were generally used in conjunction with the x-rays that many of these opaque bodies were definitely located in the urogenital tract. After the perfection of cystoscopic technique many renal and ureteral calculi (about 20 per cent), were found to be radiolucent and the diagnosis of these was only possible through cystoscopic means. While both methods are of value in the diagnosis of these calculi, the cystoscopic examination is of far greater importance. However, the most perfect diagnostic results are obtained only by the combined¹ use of the x-ray and the cystoscope. A complete physical examination² assisted by all modern means should first be considered necessary for the best interests of the patient.

TECHNIQUE.

The examination is conducted about as follows:

1. History and complete physical examination.
2. Roentgenogram of the abdomen before cystoscopic examination.
3. Cystoscopic procedure and then ureteral catheterization, care being taken to note the following:
 - a. Bladder wall.
 - b. Ureteral openings.
 - c. Resistance or obstruction on the passing of the ureteral catheter.

- d. Abnormalities in the urine from each kidney.
- e. Capacity of each pelvis.
- f. Rate and rhythm of flow from each kidney.
- g. Function of each kidney.
4. Roentgenogram with radiopaque ureteral catheters in place.
5. Roentgenogram after injection of sodium iodid solution in ureter and pelvis, or air may be injected instead of sodium iodid solution to intensify the stone shadow.
6. Insertion of wax-tipped catheter if stone is suspected.

CALCULI SYMPTOMS AND OTHER UROGENITAL PATHOLOGY SIMULATING THEM.

The principal symptoms of ureteral and renal calculi are colicky pains, frequent urination and presence of red blood cells and pus cells in the urine. However, these symptoms may be simulated by any of the following abnormalities of the urogenital tract:

1. Ureteral stricture.
2. Ureteral kinks.
3. Tumors.
4. Hydronephrosis.
5. Pyonephrosis.
6. Pyelonephritis.
7. Hydro-ureter.
8. Pyo-ureter.
9. Congenital anomalies.
10. Nephroptosis.
11. Cystitis.

Stones may be present at times and cause no symptoms whatever. These are the so-called silent stones.

We have often been told and have often read that the examination of the uncatheterized specimen is of great value in the diagnosis of calculi

but in our opinion it is absolutely worthless since many urogenital diseases will result in the finding of pus and red blood cells in the urine, also when calculi are present the urine is often normal.

DIAGNOSIS OF RADIOPAQUE SUBSTANCES IN THE UROGENITAL AREA.

When a radiopaque substance in the uretero-pelvic region casts a shadow upon the film it is usually one of the following:

1. Ureteral calculus.
2. Pelvic calculus.
3. Phlebolith.
4. Calcified lymph gland.
5. Gall stone.
6. Enterolith.

Urographic and cystoscopic methods with the help of the radiographic ureteral catheter are absolutely necessary aids to the roentgen ray in the differential diagnosis of the foregoing conditions. With the aid of a local anaesthetic³ there is little pain, and with careful technique there is no danger. If the shadow is due to a calculus in the ureter or pelvis it will be in the line of the inserted ureteral catheter, if air or oxygen be injected the shadow will be intensified and surrounded by a dark area and if the ureter and pelvis be filled with a sodium iodid solution the shadow will always be blotted out in the roentgenograms taken from both the lateral and anteroposterior positions. If the shadow is due to a phlebolith, calcified lymph gland, gall stone or enterolith, the above conditions will not be fulfilled. Many of the calculi which are not radiopaque will cast a shadow after

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several injections of collargol, the wax-tipped catheter will always be scratched, the "feel" of the stone will be elicited, obstruction more or less will be present and a dilated area above the stone is usually shown in the ureterogram. When the radiolucent stone cannot be made radiopaque by collargol injection it will often show as an encroachment upon the sodium iodid shadow and the diagnosis is made from this filling defect.

DIAGNOSIS OF UROGENITAL RADIO- LUCENT PAHOLOGY SIMULATING CALCULI SYMPTOMS.

Ureteral Strictures: Since about 90 per cent of the ureteral strictures are within three inches of the bladder and the discomfort and tenderness are practically always accentuated by menstrual engorgement it can easily be confused with tubovarian disease. Undue exertion likewise often magnifies the discomfort. The urinary findings may be grossly misleading for although during an attack it usually shows abnormal contents to guide one aright, at other times it is as a rule, normal. Hunner in a series of cases recently studied found normal urine in 75 per cent. The diagnosis rests upon the resistance to the ureteral catheter, the "drag" and pain upon withdrawing the catheter and the constricted ureter with a dilated area above, which is clearly outlined in the ureterogram. Stricture is differentiated from a ureteral calculus by the absence of scratches on the wax tipped catheter, the "feel" of a stone will not be present and no

radiopaque substance will be found in this area.

MISCELLANEOUS UROGENITAL LESIONS

1. Ureteral angulations are clearly outlined by the ureterogram.

2. In tumors of the renal pelvis the pyelogram shows an encroachment upon the pelvic area.

3. In hydronephrosis and pyonephrosis the pyelogram shows a dilated pelvis and a destruction of the calices. In the former the pelvic urine is normal while in the latter pus cells and bacteria are present in large numbers. The function of the affected kidney is decreased in both cases.

4. In pyelonephritis the pyelogram is normal, the function of the kidney is decreased, pus, albumen and bacteria are present in the pelvic urine.

5. In hydro-ureter and pyo-ureter the ureterogram definitely shows a dilated ureter. The urine from the ureteral area in the former is normal, while in the latter it contains pus and bacteria.

6. In nephroptosis the kidney is easily palpated, the plate gives a clear picture of the sagging kidney and the kinked ureter.

7. In cystitis, the bladder, cystoscopically, is inflamed to a greater or lesser degree, the bladder urine contains pus and bacteria, while from the urogenital tract above it is normal.

EXTRA-UROGENITAL DISEASE SIM- ULATED BY URETERO-RENAL CALCULI.

Gall-bladder Disease: Add an infection of the surrounding tissues to

a renal calculus and with the exception of abnormal aspirated bile findings, Palefski's sign and increased blood cholesterol, all the symptoms of gall-bladder disease may be elicited. A urographic and cystoscopic examination would easily point to the proper diagnosis.

Appendicitis: The classical symptoms of appendicitis—rigidity, tenderness at McBurney's point, colicky pain, fever, tenderness by rectal examination, pain on inflation of the colon, leukocytosis, dyspepsia, vomiting and constipation—are also the classical symptoms of a calculus lodged in the lower ureter with the usual complicating ureteritis. With ureteral stones present there are often normal urine findings, while in acute appendicitis there may be red blood cells in the urine. The cystoscopic and urographic examination will lead to the proper diagnosis and thus prevent, as we have often seen, the removal of an unoffending appendix.

Tubovarian Disease: On account of the close relationship between the ureter and the tubovarian tissue a calculus with ureteritis in the lower ureter often simulates disease in the latter. Especially during the menstrual engorgement all the symptoms are exaggerated. The correct diagnosis can be made by the combined x-ray and cystoscopic examination.

Allergic Abdominal Pain: Abdominal pain of allergic⁴ origin may so closely resemble calculi symptoms as to necessitate a cystoscopic examination. The causative factor can be discovered by cutaneous tests.

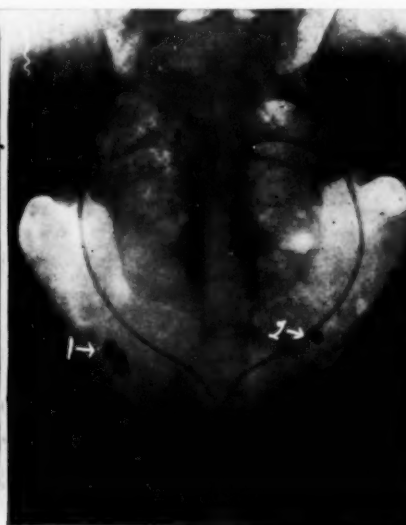


Figure I.
Which is the calculus (1) or (2)?
Figure II.

Same as Figure I.
(1). Phleboliths.
(2). Ureteral Calculus.

Figure III.

(1). Catheter.
(2). Ureteral Calculus.
(3). Sodium iodide solution showing dilatation of ureter above calculus.

Back Lesions: The pain in back lesions is often referred to this region, as well as, many times, urogenital lesions causing backache⁵.

Other Abdominal Diseases: Other conditions (and there are many) which may cause colicky symptoms in this area have been discussed in a former paper⁶.

DIAGNOSTIC MISTAKES.

In uretero-renal calculi, diagnostic mistakes are due to failure to make use of modern urologic methods. This is inexcusable for there is no reason why one physician in each county cannot master the urologic technique as outlined.

Appendicitis is often the diagnosis when calculi are present. Since four of our patients with ureteral calculi had been advised an appendectomy was necessary and two others with the same condition had had their appendices removed with no abatement of the symptoms it would seem modern urologic methods had been omitted. The gall bladder was removed in one patient with a renal calculus and the appendix was removed in another with the same trouble.

CASE REPORTS

Miss M., 29 years. (April 30, 1921.)

She had complained of severe spasmodic pains in the upper right abdomen for six months. Frequent urination has been present and at

times red blood cells have been found in the urine. She has had a slight fever at times and tenderness is present in the right kidney region. On account of the pain, frequent urination and blood in the urine, a diagnosis of renal calculus had been made. The examination revealed the presence of a stricture of the right ureter at the brim of the pelvis and just below the renal pelvis. No stone was present. The ureter was dilated by means of bougies and the Bransford Lewis dilator and she has had no trouble since.

Mr. F., 22 years. (July 12, 1921.)

Three years ago, while in France, he had a sharp pain in the appendix region and was told there was some albumen in his urine. He has complained of these symptoms more or less until the present time. He was discharged from the army with the diagnosis of neurasthenia. Due to his nervousness and inability to work when in pain, he lost one position after another. The examination revealed a very nervous patient and he made the cystoscopic investigation very difficult. The ureterogram showed an opaque substance in the line of the catheter about an inch from the right ureteral opening, a constriction below this and a dilated area above. A diagnosis of ureteral calculus was made. At this time he was called by the government for re-examination. Several plain roentgenograms were taken but since they showed nothing abnormal the sur-

geon decided the ureteral calculus had passed. He returned to us about three months later and the abnormalities as we had found them were still present. After dilating the ureter with a Bransford Lewis dilator the stone was passed and he immediately assumed a normal appearance in every way and has not missed a day's work since. Incidentally, the army officials at headquarters do not see fit to change their diagnosis and grant his compensation.

CONCLUSIONS

1. Urographic and cystoscopic methods have raised to a high degree of accuracy the diagnosis of ureteral and renal calculi.

2. Ureteral and renal calculi symptoms simulate in many instances those of other diseased organs in the abdomen and have often been the cause of operations upon normal tissues.

3. Many other abnormalities of the urogenital tract result in the same symptoms as presented by calculi.

4. When calculi are present the urine is often normal while in other urogenital diseases pus and red blood cells may often be found. Thus, in our opinion, the urine examination alone is of little value.

5. Many radiopaque substances in this area can be differentiated only by the combined roentgen-cystoscopic method.



Figure IV.

- (1). Calculus in renal pelvis.
- (2). Ureteral catheter.
- (3). Outline of pelvis injected with air.



Figure V.

- (1). Radiotranslucent ureteral calculus showing as dark notch

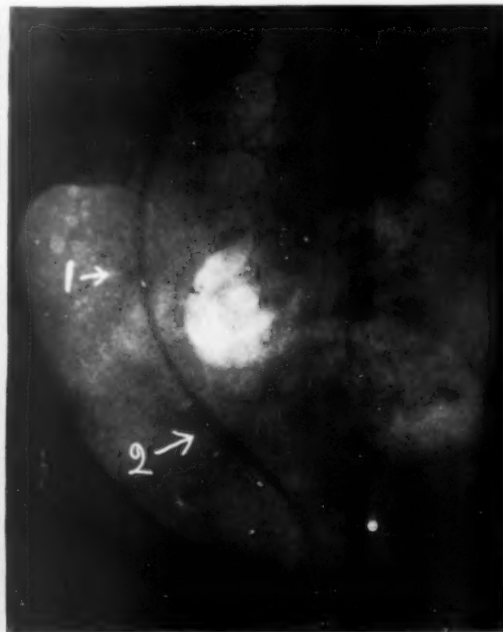


Figure VI.

- (2). Dilated ureter.
- (1). Ureteral calculus.
- (2). Two ureteral catheters in ureter showing one method of dilating ureter.

6. The early diagnosis of calculi should always be encouraged, thus the destruction of vital organs will often be prevented.

7. The careful, thorough urographic and cystoscopic examination as outlined will result, with a few exceptions, in revealing all ureterorenal calculi, and also by this method an accurate diagnosis of other urogenital abnormalities can be made.

8. The urologic examination in every case should be a part of a general physical investigation and although the initial cost of such an examination is greater than many haphazard methods, it will result in a higher percentage of correct diagnosis,

calculi will be discovered, and since 95 per cent⁷, of ureterorenal calculi can be removed by non-operative means, many useless and costly operations on this system can be prevented and also many surgical attacks upon other organs in the abdomen will be found unnecessary.

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Neurological Complications of Dental Origin and Their Sequelae*

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NEUROLOGICAL complications of dental origin are many and varied and the sequelae following in their wake often lead to serious afflictions. In order to fully grasp the true significance of the subject, it seems best to briefly review the cranial nerve most often affected in complications of dental origin, thus establishing a working basis, whereby symptomatology may be explained.

The close association of the fifth nerve, with other cranial nerves and ganglia, its particularly wide distribution and combined function, renders disturbed function difficult of interpretation (Fig. 1). In the development of the fifth nerve so many factors have entered to change its course and distribution that in man we find a complicated mechanism, very efficient and well balanced in health, and yet so subject to insult.

The fifth nerve of vertebrates belongs to that group of cranial nerves known in the primitive vertebrate type as branchiomic nerves, the other members of the series being the seventh, ninth and tenth. These four nerves take care of the innervation of the musculature and surfaces of both the skin and mucous

membrane of the pharynx. This musculature, although striated, differs embryologically from the general skeletal musculature of the body, and physiologically it is at first more closely related to visceral functions than the latter. The motor nuclei from which rise the motor fibers of these branchiomic nerves form a more or less continuous column of motor cells in the brain stem, distinct from that of the twelfth, sixth, fourth and third. The components entering into these nerves are, in those forms having the primitive pharynx of the lower fishes, of three kinds, namely: sensory, from the skin, sensory from the mucous membrane, including taste buds, and motor above mentioned.

Any modification in any segment of the pharynx is, of course, reflected in the composition of the nerves. Such modification is profound in connection with the field of innervation of the trigeminal. That is to say, the mouth and jaws exist as such in the lowest vertebrates, and not as a branchiomic cleft and arch with which we are homologizing them.

Moreover, this region lies anterior to the entodermal part of the pharynx, this excluding the trigeminal from participation in the innervation of a truly visceral mucous membrane. On the other hand, the ectodermal, or somatic surfaces are enormously extended on account of the extensive development of the snout and two ectodermal impocketings,

the external nasal cavity and the buccal cavity, the latter bearing the teeth. It is not surprising then, that visceral fibers such as those of taste, found in peripheral rami of the trigeminal have been found to belong to the other branchiomic nerves, seven and nine, and that an analysis of the trigeminal roots proximal to the ganglion, shows an absence of such fibers.

It might be of further interest to add that the modification of the rest of the primitive pharynx through the phylogenetic series shows its highest expression in man, where the disappearance of the gills, closing of the clefts and consequent shortening of the pharyngeal region almost obliterates the cutaneous or somatic field contiguous with that of the first spinal nerve. Of course, this very process of telescoping the pharyngeal segments has resulted in overlapping of deeper structures (which have been retained with their original innervation and a confusing anastomosis of peripheral rami). (Fig 2).

The fifth nerve arises by two roots near the upper border of the pons Varolii. The smaller (anterior) motor root takes its superficial origin as a mass of three or four bundles near the sensory root, but separated from it by a few transverse fibers of the pons.

The large sensory root (posterior) consists of various bundles of fibers, varying from seventy to a hundred, and takes its superficial origin near

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that of the motor root. The deep origin of the sensory root is from a nucleus just below the floor of the ventricle and just internal to the sensory root nucleus.

The two roots pass forward through an oval opening (*Cavum Meckelii*) in the dura mater, on the superior border of the petrous portion of the temporal bone, where the fibers of the sensory root form a large semilunar shaped ganglion (*Gasserian*). The motor root passes beneath the ganglion without having any connection with it and joins outside the cranium with one of the trunks derived from the ganglion.

From the *Gasserian* ganglion axones pass backward to the brain through the sensory fibers which become consolidated into the large sensory root. This root passes through an opening in the dura mater just beneath the attachment of the tentorium cerebelli to the posterior clinoid process and, coursing backward, enters the brain stem on the lateral surface of the pons, where a conspicuous group of bundles marks its superficial origin. Below this origin but directly in line with it, the superficial origins of the facial and auditory nerves are found, while just above is the superficial origin of the motor root separated from the sensory origin only by a small bundle of pontine fibers belonging to the middle cerebellar peduncle.

Entering the tegmental portions of the pons the sensory fibers soon come into relation with the trigeminal nucleus which extends from the middle of the pons through the entire length of the medulla and into the spinal cord as far down as the level of the second cervical segment, where it becomes continuous with the substantia gelatinosa of the cord. The rounded upper end of this club-shaped column is the sensory nucleus of the fifth nerve, although it embodies only a small part of the reception nucleus (*Fig. 3*).

As the sensory fibers approach this column, they divide into ascending and descending branches. The descending branches become consolidated into a compact bundle, closely embracing the lateral surface of the column of gray substance. The ascending fibers penetrate the sensory nucleus and the substantia gelatinosa and end in arborizations around the neurones of the reception nucleus. Due to collaterals and fibers given off during its descent into the cord, the spinal root gradually becomes smaller and more superficial until it disappears entirely at the second cervical segment.

In contrast to the median location of the nuclei of origin of the third, fourth, sixth and twelfth, the deep origin of the motor part of the trigeminal nerve includes groups of cells that lie at some distance from

the raphe, and fall into series with the laterally placed nuclei of the motor parts mixed cranial nerves (seven, nine and ten).

The largest contingent of the motor fibers arises as axones from the neurones within the chief motor nucleus which lies in the upper part of the pons close to the median side of the sensory nucleus. A few fibers cross over beneath the floor of the fourth ventricle and join the motor root of the opposite side.

A second constituent of the motor root includes fibers that arise from cells lying within the lateral part of the gray matter surrounding the aqueduct of Sylvius, and is known as the mesencephalic root of the fifth. During its course downward, the mesencephalic root is joined by numerous fibers which have their origin in pigmented cells of the same and opposite sides.

The fibers from all these sources become consolidated into the motor root, the superficial origin of which lies just above that of the sensory root. The motor root follows the same course as the sensory root, to and through the dura mater, passing beneath the *Gasserian* ganglion to become exclusively an integral portion of the mandibular division of the trigeminal nerve. (*Fig. 4*).

The cortical origin of the motor root, located in the lower third of the central convolution, gives rise to

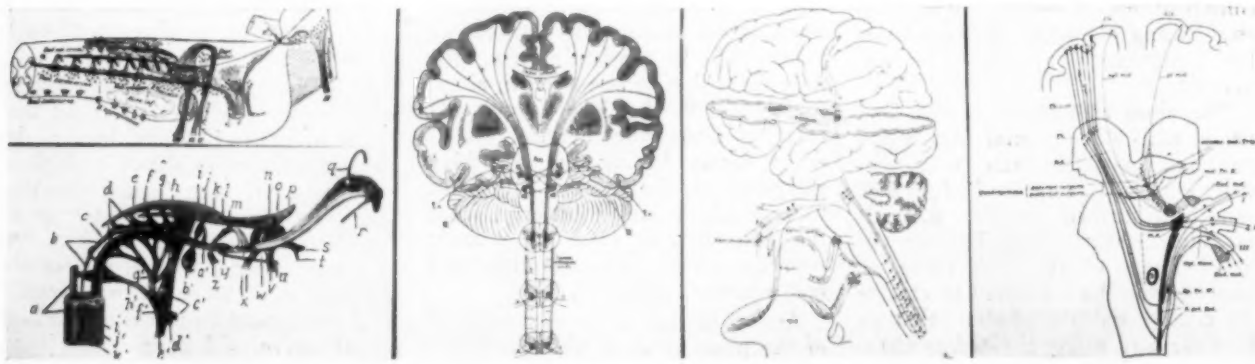


Fig. 1—Showing the origin of the cranial nerves and the extent of the origin of the trigeminus (after Edinger in Dana's *Textbook of Nervous Diseases*, 8th Ed.).

Fig. 2—Reconstruction of the cranial nerves of a human embryo 10 mm. long. The brain is cut away so as to show the primary sensory paths and motor nuclei of the different nerves: *a*, func. posterior; *b*, N. accessorius; *c*, Nucl. n. hypoglossi; *d*, Rr. mot. n. X; *e*, Radix sens. n. X; *f*, Nucl. mot. u. X (ambiguus); *g*, Tractus solitarius; *h*, radialis u. X; *i*, Gang. rad. u. IX; *j*, Radix sens. n. IX; *k*, Tractus spinalis n. V; *l*, Gang. geniculi; *m*, Radix sens. n. VII (pars intermedia); *n*, Nucl. mot. n. trigemini; *o*, Gang. semilunare; *p*, Tr. cerebell. n. V; *q*, N. trochlearis; *r*, N. oculomotorius; *s*, N. frontalis; *t*, N. nasociliaris; *u*, N. abducens; *v*, N. maxillaris; *w*, Portio minor n. V; *x*, N. mandibularis and Nucl. n. VII; *y*, Nucl. n. VI; *z*, N. facialis; *a*¹, N. IX Nucl. mot.; *b*¹, Gang. petrosi; *c*¹, N. hypoglossus; *d*¹, R. hyoid; *e*¹, N. vagus; *f*¹, Gang. nodos; *g*¹, N. access.; *h*¹, N. cerv. I; *i*¹, R. mot. vent.; *j*¹, R. mot. lat.; *k*¹, R. posterior. (Illustration from Keibel and Mall, *Manual of Human Embryology*, 1912, Vol. II, p. 143.)

Fig. 3—General scheme of the course of the pyramidal fibers and the central paths of the motor trigeminus and facial: *Vm*, lower division of the trigeminus; *VII*, root fibers of the facial; *f*, cen-

tral facial fibers; *NV*, motor, fifth nucleus; *NVII*, facial nucleus; *p*, corticospinal fibers lateral and anterior; *ra*, anterior roots; *t*, central tract of the motor nerve. (Bechterew, *Functions of the Nerve Centers*, Vol. II, p. 1313.)

Fig. 4—Pathways of the taste fibers: *I*, ophthalmic branch of *V*; *II*, maxillary branch; *III*, mandibular branch; *cg*, cortical taste area; *fg*, central ascending taste filament in median lemniscus; *ja*, subcortical paths; *Ga*, geniculate; *Gsp*, jugular and petrosal ganglia of the glossopharyngeus; *ta*, central ascending fibers of the trigeminus in median lemniscus; *ta*¹, subcortical connections of the thalamus with the inferior posterior central gyrus. (Bechterew, *Functions of the Nerve Center*, Vol. II, p. 1304.)

Fig. 5—Scheme of intracerebral trigeminus pathways: *Cs*, left hemisphere, *Cd*, right hemisphere; *Th-cort*, thalamocortical trigeminus tracts; *Th*, synapses of trigeminus in thalamus; *Sch*, mesencephalic lemniscus; *mot. Trig.*, motor trigeminus root nuclei in midbrain; *mot. Tr. K*, motor trigeminus nucleus in locus coeruleus; *Rad. mot.*, motor roots; *Ggl gass*, *Gasserian* ganglion; *I, II, III*, three trigeminus branches; *m. s.*, mesencephalic sensory trigeminus roots; *Sp. Tr. W.*, spinal trigeminus branches (Jelliffe and White, *Diseases of the Nervous System*, Ed. III p. 325.)

fibers which pass through the corona radiata, enter the internal capsule with the pyramidal tract and make their first synapses with the chief motor nuclei in the dorsolateral part of the tegmentum of the pons. Most of the fibers cross about the level of the posterior corpora quadrigemina. From here the second motor neurones pass through the foramen ovale with the inferior maxillary division and are distributed to the muscles.

The sensory receptors of the trigeminal are widely distributed over the face, the mucous membranes of the oral and nasal cavities, sinuses, etc. Affections of this portion of the fifth nerve are often combined with motor reactions.

As a result of this combination and wide distribution, intricate and complex symptoms occur.

The chief sensory impulses pass from these roots to secondary neurones through the medial lemniscus to the opposite side and end in the thalamus where tertiary neurones carry them on to the sensory areas of the brain.

The Gasserian ganglion is an important complex of nerve cells and fibers lodged in a depression known as Meckel's space, near the apex of the petrous portion of the temporal bone. It is of somewhat crescentic form with the convexity turned forward, and lies in close relationship with the cavernous sinus and the internal carotid artery. Three large trunks representing the three divisions of the nerve are given off from the anterior portion and in addition are a few filaments to the dura. The ganglion receives filaments from the carotid plexus of the sympathetic (Fig. 5).

The three divisions of the trigeminal nerve are the ophthalmic, maxillary and mandibular. The latter two divisions and their branches are those which are affected by so many of the complications arising from dental defects.

The ophthalmic division is the smallest of the three, is purely sensory and supplies the upper eyelid, the conjunctiva, the eyeball, the lacrimal gland, caruncle and sac, root and anterior portions of the nose, the frontal sinus, forehead and anterior part of the scalp.

The maxillary division is intermediate in size, purely sensory and supplies the lower eyelid, the cheek, anterior temporal region, side of the nose, upper teeth, upper lip, and the mucous membrane of the nose, lip, maxillary sinus, nasopharynx, posterior ethmoid cells, soft palate, tonsil and roof of mouth. Leaving the cranium by way of the foramen ro-

tundum, it transverses the sphenomaxillary fissure where it occupies the infraorbital groove and canal. It then emerges on the face by passing through the infraorbital foramen where it breaks up into fan-like terminals.

The mandibular division is the largest of the three divisions and is a mixed nerve. Its sensory portion is larger and arises from the lower portion of the gasserian ganglion. The motor element is a direct continuation from the motor root of the trigeminal. The two parts do not unite until they emerge from the skull through the foramen ovale.

The sensory portion supplies the skin of the side of the head, the auricle, the external auditory meatus, lower portions of the face, lower lip, mucous membrane of the mouth, tongue, and mastoid cells, the salivary glands, lower teeth and gums, temporomandibular articulation and dura mater.

The motor portion supplies the muscles of mastication, anterior belly of the digastric, mylohyoid, tensor palati and tensor tympani muscles.

The ganglia connected with the fifth nerve are to be considered as relay stations whereby impulses coming in over various nerve trunks may be either shunted off to other nerves or pass directly through the ganglia to the brain stem. It is interesting to carefully study the origin of these ganglia and to understand their connections in order to grasp the full significance of some of the various disorders affecting them. These ganglia are, as a rule, formed from cell masses which develop during the formation of the nervous system and follow the paths of the nerve trunks to their ultimate destination (Fig. 6).

In pig embryos the neural crest becomes differentiated into ganglionic masses at the fifth to sixth millimeter stage. At this time the anlage of the Gasserian ganglion appears as a somewhat irregular mass of cells

lying in close proximity with the lateral surface of the anterior region of the rhombencephalon.

During development this mass of cells is shifted ventrally until it lies laterally to the rhombencephalon in the region of the pons.

At the eighth millimeter stage in the pig, the Gasserian ganglion has already assumed its crescentic form and fibers of the sensory root have penetrated the wall of the rhombencephalon.

During this early development the Gasserian ganglion is not limited peripherally, but has cells pushed out into the proximal parts of the nerves arising from it so that in these regions it is quite impossible to determine the limits of this ganglionic mass. Similar cells may be observed associated with the fiber bundles throughout the entire length of the nerve trunks, both sensory and motor. It is probable that these cells advance peripherally along the fibers of all three divisions of the trigeminal.

These cells are migrant cells and are identical in this early developmental stage with the majority of the cells in the cerebrospinal ganglia and the mantle layer of the neural tube. It has been suggested by Johnston (1908) and others, that the sensory ganglion cells belonging to the mid-brain and the most oral part of the hind-brain become included in the wall of the neural tube instead of becoming incorporated in the Gasserian ganglion. It is these cells that are supposed to form the mesencephalic root of the trigeminal nerve, their processes extending caudward beneath the central gray substance to join the main sensory trunk of the nerve at its point of entrance into the wall of the tube.

The mesencephalic root of the fifth nerve is now considered to be the muscle sense portion of the nerve and has its ganglion cells in both the mid-brain and in the Gasserian ganglion.

The ciliary ganglion in selachians seems to be formed in part from the thalamic nerve, which is a ganglionic anlage and is closely related, in early embryonic development, with both the second and third pair of cranial nerves. In the chick a part of the ciliary ganglion is derived from the neural tube and a part from the optic nerve. This double origin of the ciliary ganglion is of interest since there is still an unsettled question as to whether the excitatory neurones in the sympathetic system have their origin as modified spinal ganglion cells or directly from indifferent ectodermal cells.

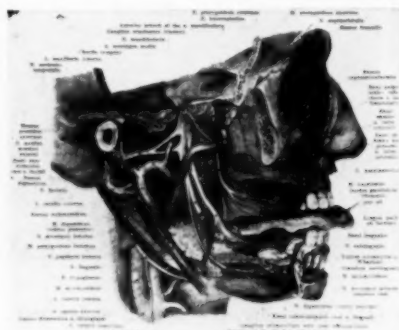


Fig. 6—Branches of the right n. mandibularis (V), deeper layer, viewed from the right (from Spalteholz, 1910 Ed.)

Both the sphenopalatine and submaxillary ganglia are probably derived from the Gasserian ganglion, but, on account of their communicating fibers with the geniculate ganglion of the facial, they may have migrated via the great superficial petrosal.

Knowing the extensive ramifications of the fifth nerve and the extremely high percentage of individuals affected with diseased teeth supplied by this nerve, it is strange that there are not more numerous cases of neurological complications of dental origin. The symptomatology of lesions of the fifth nerve is diverse as it has both a sensory and a motor part, and has many synaptic junctions with cranial, spinal and vegetative nerves.

Carious teeth, as a rule, respond so quickly to thermal shock that localization of pain in the region affected forces the patient to the dentist for correction before untoward results accrue. Sometimes, however, these teeth are neglected and serious neuritis results. Barring the passage of a stone in the gallducts or the ureters there is no pain that may be comparable to that of an acute pulpitis. Immediate relief is usually obtained by the application of suitable drugs, but the problem remains as to the proper care of these teeth afterward. If these teeth go on to the formation of an abscess or if the canals are filled and a diseased condition develops at the apex, causing serious injury to the health of our patients, we are responsible.

Calcarious degenerations in the pulp due to irritation or disease sometimes cause obscure and baffling neurological symptoms. According to Cryer, pulp stones are one of the most common causes of trigeminal neuralgia.

Malposed teeth or those in crowded arches causing backward pressure upon the large branches of the nerve, teeth with exposed and extremely sensitive gingival areas are all contributing factors in the dental origin of neurological complications.

Impacted teeth sometimes cause severe complications when their existence is least suspected and only discovered by a roentgenogram. The symptoms of impacted teeth are usually both local and general. The local symptoms are: dull pain occurring during relaxation, a sense of pressure on neighboring teeth and tenderness over the region of the impaction. These may be entirely absent. The general symptoms are headaches, neuritis, and even more severe symptoms such as acute manias have been reported. These general symptoms may in no way seem to be related to these impactions, yet entirely disappear upon the proper removal of the affected teeth. This may be readily understood if we but recall our consultation with the family physician at the bedside of a teething infant in convulsions. The nervous system of the infant is not as highly organized as that of the adult, and no doubt there is a diffusion of the impulse coming into the sensory areas of the brain, causing a hyperexcitation of the nervous system, ending in eclampsia.

Improper surgical methods employed in the removal of these impacted teeth oftentimes cause more complications than do the teeth themselves. In the lower jaw where the impacted tooth overlies the roof of the mandibular canal, the usual practice of elevating the tooth distally in order to remove it is to be condemned. Tipping the crown distalward forces the root of the tooth downward and forward, oftentimes break-

ing the wall of the mandibular canal. (Figs. 7, 8, 9).

Not only is there a primary injury to the nerves and vessels within the canal, but as healing occurs, scar tissue forms and adhesions occur, cutting down the blood supply and causing nerve irritation.

This is only one of the many sequelae following in the wake of improperly operated impactions. Sometimes the nerves themselves are severed, making a difficult case to handle. I have seen several cases where the chorda tympani has been divided by a misguided operator in his zeal to remove the root of a broken off lower third molar. The suffering of these unfortunate patients is pathetic, and they wander from specialist to specialist in a vain hope for relief.

The close connection and communication between the carotid, facial and meningeal plexuses with the superior cervical ganglion and the vagus nerve, may explain many of the systemic disorders resulting from dental impactions. Not infrequently, impacted teeth become encysted, followed by degeneration of the cystic wall and destruction of the major portion of the mandibular nerve.

The fifth nerve, coursing through bony channels, over resisting structures and farther on, with its constant exposure in the face and nasopharynx to injury and infection, makes it especially liable to traumatic and irritating conditions.

Neuralgia is the result of some irritation, directly or indirectly applied to a nerve, characterized by pain which follows the nerve trunk or its branches and tending to shift from place to place. Neuralgia may be an expression of a function disturbed locally, systemically or both.



Fig. 7—Lower impacted third molar, showing close proximity of root end to mandibular canal. If tooth is forced distally and upward by pressure on mesial surface the root end will be forced into roof of mandibular canal.

Fig. 8—Lower third molar pressing against distal surface of

second molar and overlying roof of mandibular canal. Pressure symptoms are usually present, due to impingement on the mandibular nerve.

Fig. 9—Lower third molar in transverse position.

The pain is not constant and complete absence of pain between paroxysms is the rule. The skin over the area of pain is sensitive to touch, but deep pressure may relieve the pain. Movement of the muscles of mastication during an attack of neuralgia intensifies the pain, and motion of any kind, even though slight, may excite severe stabbing pain. During and between paroxysms neuralgic areas present nerve tenderness, most marked at such points where the nerve overlies bone or is superficial. Irritation of one branch of a nerve may induce neuralgia in another nerve, closely related. The muscles and blood vessels are affected in some cases as shown by the spasmodic muscular contraction and the blanching and flushing of the affected area.

Localization of the pain usually points to the particular branch of the nerve affected, but the wide distribution and fluctuating character of the pain may obscure the cause.

In neuralgias of the first ophthalmic division, there is pain in the supraorbital region radiating over the brow and even to the vertex. The eyeball is frequently tender and may be the seat of pain. Tender points are usually found over the lower margin of the nasal bone, upper lid, and supraorbital notch. The left side is more often affected. Neuralgias of the second or superior maxillary division cause pain which is felt over the cheek in the triangle formed by lines, between the orbit, the mouth and the wing of the nose, with tender points at the lower border of the nasal bones or malar process and at the infraorbital foramen or cuspid tooth.

When the mandibular division is affected, pain courses along the jaw, tongue and corresponding portions of the face, and by its auricular branches extends to the zygomatic and parietal regions. Pain in neuralgias of the fifth nerve is usually lancinating in character, intense in degree and may cause excruciating torture. When the attacks are severe they may cause vasomotor and secretory disturbances such as lachrymation, salivation and mucous discharges from the nose. The tongue, lip, brow or entire side of the face may be swollen and oedematous. Hyperalgesia is often so intense that mastication or any motion may provoke a paroxysm of pain. Herpes or eruptions may occur if the histological changes have taken place in the nerve or its nucleus.

The patients who are affected by trigeminal neuralgias are indeed unfortunate. Usually of dental origin, but as a rule unresponsive to the

correction of dental defects these neuralgias present one of the most difficult problems the profession encounters. In a vain hope for relief oftentimes many or even all of the teeth are lost. This only brings disfavor and criticism on an honored profession, but it should be a stimulus for further knowledge.

Tic douloureux is a form of neuralgia occurring in middle or advanced life, usually severe in its symptoms and obstinate in its course. It is characterized by intense, darting, unilateral pains, which usually start in the upper lip and by the side of the nose. From here they radiate through the teeth into the eye, or over the brow, head and temple. The pains come in paroxysms, lasting for a few minutes, during which the face is flushed and secretory disturbances are present. The attack lasts for a few minutes then gradually lessens. The branches most often involved are the superior and the inferior maxillary. Examination rarely reveals any objective trouble. The disease is usually a degenerative one and is due to irritative and atrophic processes in the nerve and its ganglion. The arteries supplying the nerve often undergo the changes of endarteritis, their caliber is much lessened and the nerve cannot get its proper supply of blood. It would seem then that tic douloureux may be considered as a form of trigeminal angina.

Medical treatment may be tried using nitroglycerin in doses of 1-200 gr. every two hours. Crystalline aconita, gelsemium, etc., are useful.

The common practice of extracting the teeth almost always results in failure to cure and ought not be undertaken without good reason. Massive doses of strychnin for patients who may be hospitalized sometimes gives relief. Opiates are to be avoided. Surgical removal of the nerve at a point as deep as possible is the only operation to be seriously considered and while there may be a recurrence in six months to five years, the alleviation of suffering even for so short a time is worth while.

Resection of the second and third nerve roots, as devised by Hartley and later modified by Abbe, gives relief. Alcoholic injections are, on a whole, rather disappointing and extremely dangerous in unskilled hands.

Trigeminal paraesthesias are characterized by peculiar disturbances of numbness, thrilling or formication along the course of the nerve. The sensation may be nearly constant and

is excessively annoying, although actual pain never occurs. It is regarded as an abortive form of neuritis.

During the past few years focal infection has been recognized as assuming tremendous importance as one of the great provocative causes of mental disease.

Especially has there been an almost generally accepted belief that foci of infection occurring around the root ends of teeth, were responsible for certain types of mental disturbances. Toxic psychoses, with various degrees of mental changes, have been entirely relieved by the proper removal of foci of infection. Disappointing in the extreme, however, have been those cases in which simple extraction has aggravated a condition already existing.

If the neurological complications occur as a result of foci of infection thorough eradication of the diseased tissue as well as the offending teeth must take place before cures will result.

The statistics from the dispensaries of some of the school children whose mouths have been cleared of focal infection show unbelievable percentages in increased mentality. If these statistics are true, it is less difficult to comprehend the importance of focal infection in mental disorders.

Every year research work is being carried on in neurology and the diseases of the nervous system. We, as dentists and oral surgeons are dealing constantly with nerves most often affected by disease and injury. It is then our duty to study and prepare ourselves that we may recognize, care for, and prevent neurological complications of dental origin and their sequelae.

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The Radiographic Examination of the Alimentary Tract*

(With Analysis of Routine Examinations of 5,033 Hospital Cases.)

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THE value of the roentgen examination in disease of the alimentary tract is so well established as an integral part of the routine procedure in the diagnosis of such conditions, that it would be superfluous to present an analysis of material with the object of indicating its value as a clinical aid. This review was therefore undertaken as a general summary of the recent work in this division and with the purpose of determining the cause of the discrepancies between the radiographic and surgical findings.

Material: The analysis is based on the routine study of the alimentary tract of 5,033 cases examined in the Department of Roentgenology at Bellevue Hospital, during a period of three years. The tabulations are made according to radiographic findings. Where multiple lesions were present, the most important lesion from a symptomatic viewpoint only is classified. Abnormalities of the respiratory, cardiovascular and other systems discovered during the routine gastro-intestinal study are not included.

Pathological findings were reported in 1,916 cases or 38 per cent, and negative findings in 3,117 cases or 62 per cent. This may be considered a definite commentary on the position the roentgen method holds in the routine examination of the patient presenting gastro-intestinal symptoms. It represents the clinician's appreciation of the fact that the history, in association with the physical and other laboratory findings, is insufficient to definitely exclude the presence of an organic lesion.

In the vast majority of instances the roentgen contribution is towards a surgical diagnosis in a positive way and towards a diagnosis of functional disease, only by exclusion of an organic basis for the symptoms.

METHOD OF EXAMINATION

Most of the information of this examination is obtained by fluoroscopy. Radiographs are made for record and detail study when neces-

sary. The fluoroscopic method, besides those advantages well appreciated by roentgenologists, has the advantage of economy of time and material in routine work. The plate was always looked upon as corroborative of the fluoroscopic findings. The exposures are at times made directly during fluoroscopy, with the aid of the double screened film; this procedure is particularly helpful if manipulation is necessary to demonstrate a questionable deformity or fixation to deliver into view such structures which require special posture. Re-examinations by routine or special methods were made in indeterminate cases. Antispasmodics were utilized as indicated. Tr. Belladonna 20 minims T. I. D. was employed; a fresh solution is absolutely essential, the desired antispasmodic effect was not obtained until beginning loss of accommodation occurred, the patient complaining of "blurred" vision. Dryness of the throat could not be considered an indication of the full effect of the drug as this was invariably reported after the first dose.

ROUTINE PROCEDURE

The esophagus is examined fluoroscopically, with the use of the barium-mucilage of acacia paste, as suggested by Hirsch. With a small quantity of this mixture the entire lumen of the organ can be outlined.

The examination of the stomach and intestines is made according to a routine established in this department some years ago. It entails the double meal method of Haudek. No catharsis is permitted for thirty-six hours before the examination. The patient, so prepared, presents himself for the first observation six hours after the ingestion of the so-called motility meal. This meal consists of four ounces of oatmeal with two ounces of barium sulphate, a slice of toast and six ounces of water.

Fluoroscopic observations are made according to the following routine:

1. Study of motility.
2. Study of gastric morphology with the sedimentation mixture.
3. Study of gastric morphology with the suspension mixture.

4. Twenty-four hour period—study of gastric and intestinal motility and morphology of colon.

5. When indicated, observations are continued, at daily intervals, until complete evacuation has occurred.

6. Examination of the colon by clysm, if indicated.

ANALYSIS OF CASES.

Esophagus: By far the most common abnormality of the esophagus was carcinoma; this was found in 96 persons, of whom all but three were males, the proportion being 31 males to 1 female. The average age was 59 years. The commonest site of the lesion was the auricular portion; lesions of the aortic and supra-aortic areas being present in but about 5 per cent. The growths as a rule were rather extensive; a noteworthy feature of these cases is the relatively short duration of the symptoms; these varied directly with the degree of stenosis, so that even in cases of extensive involvement the clinical features often were not striking. On several occasions a small unsuspected growth of the diaphragmatic portion was discovered.

The defective contour produced by this lesion is significant; it is of variable extent, involving one or more surfaces and is persistent; most often definitely irregular in lesions of the esophagus proper, while the neoplasm in the region of the introitus is frequently seen as a regular, circumscribed, conical defect with its apex downward. Peristalsis is absent in the involved area, while the peristaltic activity above the lesion is dependent upon the degree of stenosis and the infiltration of its muscular coat. Perforation was present in none of these cases, in spite of very extensive involvement. In several cases, particularly those with marked stenosis and with lesions of the upper esophagus the ingesta were regurgitated and passing through the glottis entered the trachea and bronchi. Spasm of the pyloric portion of the stomach frequently accompanied carcinoma of the epicardial portion of the esophagus.

Marked dilatation of the esophagus did not occur with carcinoma.

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but was invariably associated with cardiospasm. In one instance the width of the gullet was ten centimeters (teleo-plate measurements). Three of the most marked cases, presented a history of protracted pleural disease preceding the dysphagia. In but one patient an associated organic lesion, a carcinoma of the pylorus was present.

Nine cases of diverticula were recorded; these were mostly of small size and of the pulsion type.

Foreign bodies of all descriptions were localized in the esophagus, most often in the region of the cricoid constriction. The commonest of these were pins and coins in children and dental plates in adults. One of the latter carried a large dental plate in the lower esophagus with but little discomfort for one and a half years. A rather unusual case was that of a psychopathic patient, who swallowed a teaspoon which lodged in the upper third of the esophagus.

Stomach: Ulcer—164 cases. Ulcer of the lesser curvature and posterior wall of the pars media constituted 66 per cent. These included all types, from those with a small niche to very large crater formation. None were found on the anterior wall or greater curvature.

Gastric ulcer, associated with ulcer of the first portion of the duodenum was observed in four patients and in each of these the gastric lesion was shallow and situated high on the posterior wall.

Radiographic findings of gastric ulcer sought for were:

1. Niche.
2. Irregularity of contour.
3. Localized tenderness.
4. Residue isolated in crater or accessory pocket.
5. Reflex phenomena.
6. Retraction.
7. Gastric retention.
8. Hypoactivity.
9. Hypotonia.

We believe that for a definite diagnosis, the direct evidence of ulcer is the only reliable sign, and actual demonstration of the deformity is necessary, yet, in a few instances, the indirect evidence focused the attention to the consideration of ulcer and these inferences were confirmed at operation. Spastic phenomena were not commonly observed. Decreased gastric tone and peristalsis in association with gastric retention were fairly constant features accompanying ulcer of the stomach. The most complete pyloric obstruction is produced by the callous or indurated ulcer of the pylorus. In one case a medium sized gastric residue remain-

ed for eleven days at which time the observations were concluded. A constant feature of such obstruction of the pyloric area was the marked loss of tone and decreased, irregular or reverse peristalsis.

Carcinoma: 221 Cases. This lesion represents 4.4 per cent of the entire series or 11.5 per cent of the pathological group. The commonest site was the pylorus and the most frequent type, the medullary. Males were more often affected. The average age of these patients was about fifty years; the youngest was a female patient, twenty-six years of age with extensive scirrhus involvement. A striking feature of the scirrhus variety was the slight symptomatology, in spite of extensive infiltration.

The diagnosis is made from direct evidence; indirect manifestations in carcinoma are relatively insignificant. A gastric retention of various amounts commonly accompanied the growths of the medullary type, while hypermotility was more frequently associated with scirrhus infiltration. The decreased flexibility and distensibility and the absence of peristalsis of the affected area were considered important features in the latter class of cases. Operative findings would indicate that the extent of involvement of infiltrating carcinoma cannot be accurately determined by the roentgen method, as invariably the lesion is found at operation to be more extensive than would appear from the radiograph.

An unusual case of hyperplastic tuberculosis of the stomach was met in which the lesion was considered primary in as much as no other evidence of this disease was discovered elsewhere. The radiographic appearance suggested a large callous pyloric ulcer with a decided gastric retention.

Regarding syphilis, a proven case of this condition has not been recorded in this series.

Duodenum: Ulcer—314 Cases. These were found in the first portion or bulb. Of these, 75 per cent were of the non-obstructing variety, while the remainder were associated with sufficient obstruction to cause a gastric retention of one-fourth or more of the motility meal. The deformity produced by this lesion is usually characteristic, being the result of ulcer defect, spasm, adhesions or a combination of these factors. It is extremely important in the study of ulcer to visualize the duodenum to complete satisfaction. The cause of misinterpretation of this condition is chiefly due to conclusions derived from incomplete or un-

satisfactory examination. Spasm of the first portion of the duodenum, due to extrinsic cause and deformity from periduodenal adhesions is sometimes preplexing, but misinterpretation can most often be excluded by careful study.

Increased gastric tone, peristalsis and motility were rather commonly associated with ulcer of the duodenum. In the obstructive variety there was invariably a temporarily increased peristalsis of regular type, beginning above a point normal for the habitus and extending completely to the pylorus with a definite retention in the stomach at the six hour period; twenty-four hour gastric residue was less common than with pyloric ulcer. In these obstructive cases the bulb may be incompletely visualized on account of the marked contracture of the affected duodenum and the small amount of gastric evacuation, yet the findings are so characteristic that a diagnosis of obstructing duodenal ulcer can be safely made on the indirect evidence. Ulcer of the duodenum beyond the first portion has not been observed in this series. For a diagnosis of duodenal ulcer, the following features are considered:

1. Niche.
2. Bulbar deformity.
3. Tenderness.
4. Antral dilatation.
5. Exaggerated gastric peristalsis.
6. Increased gastric tone.
7. Abnormal motility.

There were several cases of obstruction of the third portion of the duodenum, due to spasm at the duodeno-jejunal junction, consequent to extrinsic lesions, more commonly abnormalities of the ileocecal region or gall bladder.

Periduodenal adhesions due to gall-bladder disease, postoperative conditions of the right upper quadrant or Harris bands were noted in 69 cases.

Abnormalities of filling and unusual position of the jejunum and ileum, due to extrinsic causes were not uncommon. The indirect evidence furnished by the condition of the small intestine frequently offered a clue to a lesion elsewhere. Adhesive peritonitis with abnormality of the ileal coils was observed in five cases.

POSTOPERATIVE EXAMINATIONS

The purpose of these was to study the gastric function after resection or gastro-enterostomy and the search for complications consequent to surgical procedure. The postoperative interval of the test varied from three weeks to nine years. In practically every instance at least a small amount

of gastric evacuation occurred through the pylorus, even when the latter had been occluded at operation. Difficulty was witnessed in the satisfactory demonstration of the stoma of high position and of large size through which the contents were rapidly evacuated; such conditions very seriously handicap the examination of the suspected ulcer at or near the site of enterostomy. Tenderness on deep pressure directly over the stoma was complained of by many of those examined, regardless of the interval since operation. Gastro-jejunal ulcer was thought to be present in seven patients.

Those cases in which there had been an excision of a gastric ulcer of the lesser curvature all presented a deep, broad, constant incisura of the greater curvature, opposite the zone of resection. Three patients who had been operated for perforated gastric ulcer, one to two years prior, were examined and in none of these was any evidence of the surgical procedure revealed but in each a definite ulcer of the first portion of the duodenum was noted; two of this group came to second operation and the finding was corroborated.

Colon: The chief pathological conditions of the colon noted were colitis, new growth and obstruction.

Colitis of tubercular origin was found in 58 patients in most of whom there was associated an extensive pulmonary lesion. The most frequently affected site was the ileocecal region. The diagnosis of the majority of these was based upon the marked irritability of the affected portion. The hyperplastic tubercular process with its persistent filling defect occurred much less frequently.

Carcinoma of the colon was studied in 34 cases. These were chiefly of the annular variety and fairly well localized; the site of predilection was the sigmoid flexure. Acute obstruction was recorded in 22 cases, included in this number are also several cases of new growth which at the time of examination caused almost complete obstruction.

Diverticula of the colon were noted in twelve patients, though symptoms referable to this condition, were elicited in but relatively few of these.

Appendix: In the roentgen study there must be distinguished an acute appendicitis from an abnormal appendix presenting no evidence of an active inflammatory process. Fixation, irregular filling, caused by the presence of enteroliths or constriction of its lumen, unusual position and retention after the colon has been completely emptied, naturally

or by catharsis, ordinarily indicates an abnormal appendix, one which may have been damaged by previous disease, and a probable source of danger to the patient. An appendix, presenting all or several of these characteristics, was termed a potentially pathological appendix and when it presented, in addition, unmistakable tenderness to localized pressure, with or without reflex spastic phenomena, an active, but perhaps low grade inflammation was considered. It is noteworthy that the point of maximum tenderness invariably corresponds to the area of its irregular filling.

The mere visualization of the appendix is no criterion of its pathogenicity, while on the other hand, its failure to fill after suitable procedure suggests the possibility of an obliterating or atrophic type. The appendix is examined in the routine gastro-intestinal examination, not only for its intrinsic pathology but as a prolific cause of extrinsic reflex phenomena. During the routine examination of 141 consecutive cases, the appendix was visualized satisfactorily in 72 per cent. Appendices which were not visible after ingestion of the routine mixtures, were often well filled immediately after evacuation of, or at the twenty-four hour interval following an opaque clysma. This occurred even more frequently when there had been injected a sufficient amount of mixture to distend the cecum and pass through the ileocecal valve to the ileum. By this method in another series the appendix was visualized in 90 per cent. It is of interest to note that the patients comprising this entire series were of an average age of about 43 years, consequently the inference that decided atrophy of the appendix occurs in middle life cannot be substantiated by these statistics. The appendix was reported pathological in 136 cases of the total.

In one case an appendical abscess was discovered during the routine gastro-intestinal examination, and the findings corroborated at operation. No special examination was made of the appendix unless the patient had been referred for examination with such a clinical diagnosis, or when in cases in which gastric or duodenal pathology was suspected, reflex signs pointed to the appendix as the probable cause of the disturbance.

Functional Disturbances: The diagnosis of spasm was made only when the underlying cause of same could not be definitely ascertained. Spasm of the pylorus occurred most

commonly, and in this connection it is noteworthy that gastric retention, the result of spasm, may be relatively larger at the twenty-four hour period than that noted at the six hour observation, whereas the twenty-four hour residue, due directly to the organic lesion was proportionately smaller than the six hour retention. Ileocecal incompetency was reported in that group in which an abnormally large amount of opaque mixture entered the small intestine with relatively little pressure. In certain cases it has been deemed advisable during examination by clysma to fill the terminal loop of the ileum by increasing the pressure, for the purpose mentioned above and also that the ileum may act as a land mark between the cecum and ascending colon when these portions are distorted beyond recognition by an infiltrating lesion.

Gall Bladder: During the routine examination, evidence indicating pathology of the gall-bladder was noted in 143 cases. Of these seven contained calculi, sufficiently dense to be noted during the gastro-intestinal examination; this tabulation bears no reference to the results obtained from special examination of the gall-bladder. Of the remaining cases 27 were considered to have an enlarged gall-bladder. The remaining 114 presented indirect evidence manifested by spasm or adhesions. There also occurred a group of cases in which no suggestion of abnormality during routine examination was found, though a pathological gall-bladder was reported at operation.

Congenital Anomalies: Six cases of complete situs inversus and one of dextro-cardia were noted. Four of these cases, however, were referred for confirmation of the suspected anomaly. The colon was incompletely transposed in five cases, in these the position of the cecum was variable, being either in the region of the inferior surface of the liver or with the ascending colon directly in the midline of the abdomen. Several other such cases of anomalous position of the colon were noted, but classified according to the organic pathological condition presented. One case each of congenital atresia of the esophagus, atresia of the ileum, hernia of the right diaphragm and one of the left dome are also included in this series.

As stated, one of the prime objects of this review of gastro-intestinal examinations was to investigate the discrepancies between the conclusions based on radiographic evidence and the surgical and postmortem findings.

RADIOGRAPHIC EXAMINATION OF ALIMENTARY TRACT—RENDICH

After consideration of the available data relative to this work, there immediately arises the necessity of dividing these discrepancies into two major classes, first, radiographic limitations, and second, radiographic errors.

Radiographic Limitations: This caption is chosen because it is felt that there is certain desired information which the present radiographic method of examination of the gastrointestinal system does not now afford.

A pathological gall-bladder is occasionally found at operation, when no suggestion of same had been observed by the roentgen study. While of course, this examination is essentially one of the alimentary tract and not of the gall-bladder, yet these organs are so closely related anatomically and physiologically, that abnormality of the latter might be expected to produce more definite evidence through the gastro-intestinal study, than is sometimes found. Gall-bladder pathology may be indirectly manifested by evidence of adhesions, producing unusual position or contour of the adjacent intestine, or by pressure defects due to its enlarged size and again by spastic phenomena noted in the gastro-intestinal tract, but unless the intrinsic lesion of the gall-bladder is fairly well marked these indirect and even direct signs fall short too often to consider that such examinations exclude the possibility of a pathological condition of the gall-bladder with any thing like the certainty by which a lesion of the alimentary canal can be excluded.

Adhesions: Unless a very definite decrease of the mobility with deformity of contour or altered function is demonstrable a diagnosis of adhesions is not offered. As a consequence, the surgeon's notes are not infrequently at variance with the roentgen findings on this point, yet in spite of this, such conclusions are unwarranted unless very firmly grounded. Adhesions may be readily inferred radiographically but less often found at operation.

Still another discrepancy occurs in the determination of malignancy. As is generally recognized, ulcers apparently benign, as judged strictly from a radiographic viewpoint, may be proved malignant by the pathologist. There are of course, certain gross features of the benign and malignant lesions which assist in determining the character of the deformity but even these may fail in the unusual case. Further in connection with malignancy, it must be remembered that the extent of the infiltrative growth, cannot be accurately inferred from the radiograph alone. The lesion is often found at operation to be more extensive than appeared from the deformity noted during examination, as the infiltration near the borders of the lesions may be insufficient to produce a recognizable defect of contour. Decreased flexibility and distensibility are important features in this connection but unfortunately slight changes of these characteristics cannot always be accurately established.

Radiographic Errors: These may be further divided into:

(1) Incomplete or unsatisfactory examination, which occurs for one reason or another, such as the patient's condition or his inability or refusal to co-operate or carelessness on the part of the examiner with resultant conclusions drawn hastily and unwisely. No excuse can be offered for the failures entering this group, yet unfortunately there are a certain few which occur and which cannot otherwise be properly classified. The roentgenologist must constantly guard against this pitfall and definite conclusions should not be drawn unless the case has been studied to complete satisfaction.

(2) Errors in judgement; certain of these are inevitable, and the number is in indirect ratio to the experience and skill of the examiner.

Number of cases examined.....	5033	
Positive Reports	1916	38. %
Negative Reports	3117	62. %
Esophagus	134	7. %
Carcinoma	96	
Cardiospasm	12	
Diverticula	9	
Foreign body	8	
Dilatation	3	
Ulceration (benign)	3	

Benign stenosis	1	
Paralysis pharynx (dilatation)	2	
Organic Disease of Stomach.....	164	8.6%
Ulcer	108	
Pars Media	51	
Pars Pylorica	4	
Associated Gastric & Duodenal	1	
Unclassified	221	11.5%
Carcinoma	103	
Pars Pylorica	48	
Pars Pylorica & Media.....	36	
Pars Media & Cardia.....	18	
Pars Cardia & Esophagus.....	13	
Probable carcinoma.....	3	
Unclassified	10	0.5%
Pyloric Obstruction	6	0.3%
Gastritis	126	6.6%
Postoperative Conditions of Stomach	103	
Gastro-enterostomy	13	
Partial gastrectomy	7	
Gastro-jejunal ulcer.....	3	
Ulcer excision	340	17.7%
Organic Disease of Duodenum.....	314	
Ulcer	11	
Diverticula	15	
Obstruction	186	9.7%
Disease of Appendix	149	7.8%
Organic Disease of Colon.....	34	
New growth	22	
Obstruction	21	
Colitis	58	
Tuberculosis	12	
Diverticula	2	
Stricture—rectum	11	0.6%
Postoperative Conditions of Colon	148	7.8%
Disease of Gall Bladder	114	
Abnormality inferred during routine gastro-intestinal examination	7	
Calculi	27	
Enlargement	107	5.6%
Adhesions	6	
Perigastric	69	
Periduodenal	19	
Pericecal	13	
Pericolic	20	1. %
Congenital Anomalies	5	
Incomplete migration of cecum	1	
Megacolon	3	
Megacystic	6	
Situs Inversus	1	
Dextro-cardia	1	
Atresia of Esophagus	1	
Atresia of ileum	2	
Diaphragmatic hernia.....	2	
Extra Gastric Conditions	154	8. %
Extra gastro-intestinal mass	65	
Mechanical displacement by ascites	12	
Eventration	7	
Enlarged liver	30	
Tumor liver	13	
Enlarged spleen	9	
Tumor—pancreas	6	
Tumor—retroperitoneal ..	2	
Unclassified	9	
Miscellaneous	30	1.6%
Adhesive peritonitis	5	
Foreign bodies	12	
Atony and dilatation, no organic lesion	7	
Hernia (inguinal)	2	
Ileo-colic fistula	2	
Fistula to hepatic duct.....	1	
Obstruction jejunum	1	
Functional Disturbances.....	110	5.7%
Ascribed to	21	
Pylorospasm	18	
Colonic stasis	44	
Ileo-cecal incompetence.....	12	
Spasticity of colon	15	
Dilatation of colon		

EDITORIAL

The JOURNAL OF RADIOLOGY

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Man or Machine.

In this day of mechanical inventions one is apt to fall into the mistaken notion that the machine is superior to the man. This tendency is present in all walks of life as well as in medicine. In medicine this failing is manifest in the great increase in the use of modern laboratory methods. Many of the recent graduates in medicine pass directly from the medical college into some laboratory specialty and thus lose proper perspective. In order that the physician himself may really know medicine as it is, it would seem imperative for every graduate in medicine to first enter general practice for a period of years after which he will be better prepared to know to what specialty he is best adapted and to know the relationship of the chosen specialty to general medicine. In this knowledge and its proper application lies the only true service to the patient. The patient is not a pair of tonsils, or an appendix or a set of paranasal sinuses, but on the contrary these items and many others all combined make up only the physical body in which the patient lives. The patient is sick and needs treatment. It may be determined that the removal of the tonsils will benefit the patient, this should then be done, but to reverse the process is only to end in disaster.

Previous editorials in these columns have attempted to call attention to this thought. Certain sequential events have led us to believe they were at least productive of thought in other members of the medical profession. Now comes evidence of thought along the same line by a layman of international influence, George Horace Lorimer, Editor of the *Saturday Evening Post*, who in the issue of March 1, 1924, has stressed the thought in an editorial entitled, "Man's Mechanical Rivals." From this we quote:

"Many an apparatus is of such extraordinary sensitiveness and is so flexible in operation that the temptation is to trust it as implicitly as if it possessed in addition the human faculty of judgment. Therein lies the danger of its employment. No machine, broadly speaking, is so perfect that it can be used as a substitute for trained judgment. The finest mechanical device never acquires the ability to correct its own mistakes.

It never learns. It gets use and wear, but no experience.

"Modern medicine offers countless illustrations of the rivalry between man and the machinery of his own creation—a rivalry in which man is still ahead. The use of x-rays in surgery was rightly hailed as an epoch-making advance; but everyone knows that save in the most obvious cases the value of plates thus produced is comparatively small unless the services of a specialist skilled in interpreting these intricate shadow pictures can be drawn upon. In like fashion it is possible to study the chemical processes going on in the body with a refinement of detail that a few years ago would have been regarded as incredible. The net efficiency of a patient, considered as an assembled group of functioning organs, can be determined with striking accuracy; and yet when the reports are all in, no electrical contraption can balance one against another, assign the proper weight to each, lay down a course of treatment and tell the patient whether he will live or die.

"Professional leaders everywhere are keenly alive to the limitations of mere apparatus. At the Harvard Medical School, for example, they tell with amusement of an obscure heart case that baffled the most delicate of modern diagnostic methods. Even that highly sensitive device which records the intensity of the electrical impulses generated in different parts of the heart shed little light on the nature of the ailment. Finally an old-school practitioner, who did not pretend to be especially up-to-date, borrowed an ordinary stethoscope, and in five minutes was able to make a positive diagnosis. The younger men readily confirmed it when they were told what to listen for. The explanation is simple: The old-fashioned doctor had not come to depend upon the aid of elaborate electrical contrivances. He relied upon himself and a pair of ears that had been listening to hearts for forty years, and steadily learning as they listened."

Mr. Lorimer has emphasized the fact that even though all possible evidence has been obtained by mechanical, chemical and other means, so far as the patient is concerned this has little or no value until the properly trained medical mind correlates the evidence, forms a judgment and instructs the patient what to do to get relief.

When applied to the specialty of radiology this means that the mere mechanical act of making x-ray images on films is only part of the function of the radiologist. If he stops at that point he becomes a mere mechanic, failing to develop and fill the larger field of the true radiologist. He must correlate all data obtained during the process of x-ray examination including fluoroscopic findings, evidence shown on x-ray films, knowledge of anatomy, pathology, physiology and clinical medicine and interpret all these findings in terms of the patient. It would appear to the thinking radiologist that much of the criticism of the specialty is due to smallness of vision on the part of its own members. The way to overcome such criticism is to disprove it by actual living. This is a slow, tedious process but is the only sure way.

This criticism applies not only to the man practicing radiology but to the physiotherapist as well. A letter

recently received from a layman who thought he had been poorly treated by a physician employing physiotherapy emphasizes this fact forcibly. A quotation will emphasize his viewpoint. "He turned my treatments over to his office girl, having me first introduce the rectal appliance myself, and adjust the tin doodad on my tummy. Then the girlie came in, attached the wires and turned on the juice, asking me to tell her 'when it gets too hot.' The after-massage appeals to me as very essential. This my good friend, Dr. would not have done under any circumstances or at any price because he 'doesn't like fooling around anybody's rectum.'"

It would appear that the physician referred to in the above letter did not treat the patient's psychological nature properly, thus losing his confidence. It would also appear that the physician either did not know the proper technique for successful treatment of this patient or else he was too lazy or too indifferent to carry it out. If success is to be attained in radiology and physiotherapy the greatest attention must be paid to proper technique and to the detail of carrying it out.

The radiologist or physiotherapist is or should be first a physician caring for patients just as conscientiously as any other physician.

This discussion is well closed by quoting a little parable which appeared on the cover page of the Bulletin of the American Medical Association, February, 1924:

An inquiring traveler came upon three men engaged in cutting stone.

"What are you doing?" he asked of the first.

"Cutting stone," answered the man.

"What are you doing?" he inquired of the second.

"I am earning five dollars a day," the man replied. "And what are you doing?" the third man was asked. "I am building a cathedral," was the answer.

There's a moral in this story for the idler in medicine—he's the man who is just "cutting stone;" there's a moral in it for the man engaged in the practice of medicine who looks on the work in which he is engaged as a "business"—he's the man who is "earning five dollars a day;" there's a moral in it for the earnest physician who believes that he is engaged in the noble work of a scientific profession, whose first and lasting aim is to render helpful service to all mankind—he is "building a cathedral."

Iowa Radiological and Physiotherapy Society.

At the annual meeting held in Des Moines, Feb. 26, 27, and 28, there was a large attendance in spite of the impassable condition of the roads. The program was helpful to all present.

The following officers were elected for the ensuing year:

President B. H. Sherman, M. D., Dexter
Vice-President T. B. Lacey, M. D., Glenwood
Sec.-Treas. E. W. Baker, M. D., Des Moines

Colorado Society Elects Officers.

At a recent meeting held in Denver this society elected the following officers:

President H. P. Brandenburg, M. D., Denver
Vice-President N. B. Newcomer, M. D., Denver
Sec.-Treas. D. H. Montgomery, M. D., Denver

DEPARTMENT of TECHNIQUE

Roentgen Ray Tube Centering on Sagittal Plane of Body In a Rapid, Simple and Accurate Manner

WILLIAM J. MANNING, M. D.,

Washington, D. C.

IN PRESENTING this graphic method of tube centering the author has described its use in his practice with the intent to aid those members of the Society who live in remote districts and who are physicians and surgeons possessing their own apparatus, in order that their resulting work may be produced with a maximum of ease, accuracy and dependency as concerns the midline of body and the vertical ray.

Figure 1 simply shows a table along the surface of which has been inserted aluminum screweyes one-fourth inch in size. They have been spaced at approximately one foot intervals in a true line. Through these screweyes is threaded an alignment cord or string of any convenient or given length.

Figure 2 depicts a patient stretched in a ventrodorsal position upon the table, though this attitude may be readily changed to a dorsoventral presentation with the same accurate results should such action be desired.

The operator takes up his position upon the right lateral side of patient as being more convenient to him than the left, and after examining patient to note that the back or abdomen, as the case may be, is in close adaptation to the surface of table, now grasps each terminal of the alignment cord in the right and left hand respectively.

The cord is now pulled taut from each hand to the other which aligns the cord in the screweyes under the body, and the right cord terminal is thence passed by the right hand from

*Received for publication March 6th, 1924.



Fig. 1—Showing alignment cord in position on table.

Fig. 2—Patient in position for alignment cord adjustments.

the lower extremities in an upward, forward direction, along the median line. The right cord terminal, still in the right fingers, is now made to thread through a small swivel attached to a leather collar previously adjusted to the neck of patient, the same terminal being continued upward to exactly the center of terminal cathode of tube at the right of operator.

The left cord terminal, guided by the left fingers, is made to pass in a straight line, parallel manner, over the occipital posterior protuberance and follow the interparietal or sagittal suture and vertex of cranium, forehead, glabella, internasal suture, median palatine suture, to mental symphysis on chin, the alignment cord being thence threaded through the swivel and continued upward to the left terminal of tube of anode at the left of operator.

The body of patient is adjusted from time to time until the cord falls in the exact median line. The tube shift is then locked in position, the leather collar is unbuckled and the terminals of alignment cord allowed to drop at each of the respective ends of table, all substantially as shown in the photographs.

Tube positions may be changed to either the right or left of the sagittal line after this point has been determined by the plumb bob on the alignment cord. The plumb bob line may be held in either the right or left fingers, being placed exactly in the center or superimposed over the alignment cord terminal, or it may be separately attached to the terminal section of cord as shown in photograph. A spirit level resting on the tube shift carriage guides, to be noted in Figure 2, quickly and accurately gives the operator a horizontal bearing as concerns the x-ray tube.

Medical Science Building,
Washington, D. C.



CASE REPORTS

Radiographic Demonstration of Calcification of the Myocardium During Life

THOMAS SCHOLZ, M. D.,
New York City

MYOCARDIAL calcification is, as all our textbooks of pathology state, a very rare condition. Roentgenological literature on demonstration of myocardial calcification intra vitam is still scantier. In fact, the case to be reported herewith is the first one on record in which calcium deposits within the heart wall itself have been demonstrated roentgenologically, have been differentiated from pericardial calcification, intra vitam, and in which the roentgen diagnosis was confirmed by autopsy.

The condition was detected accidentally during a special type of roentgenological investigation in which every newly admitted patient was subjected to a brief, but complete, roentgenological examination. The x-ray findings in each case were recorded, compared with the clinical findings and finally checked up by autopsy findings as far as autopsies were obtained. These comparative studies had been carried on quite systematically for several years. In the course of such investigations the condition to be described now was discovered.

The patient is a man of 74 years, married, peddler by occupation, admitted to the Montefiore Home April 30th, 1917, died July 11th, 1917.

Family history: Negative.

Personal history: Excessive smoking; no alcohol; strenuous work all his life; no children; wife has had no miscarriages.

Previous illnesses: Syphilis denied; gonorrhea at 18; otherwise negative.

Present illness: Sudden onset eighteen months ago, with loss of consciousness and speech, with stupor, involuntary urination and defecation. No convulsions. Confined to bed for two months. Gradual recovery. Since then has had chronic cough with expectoration, swelling of feet, dyspnea on slight exertion.

Physical examination: Evidence

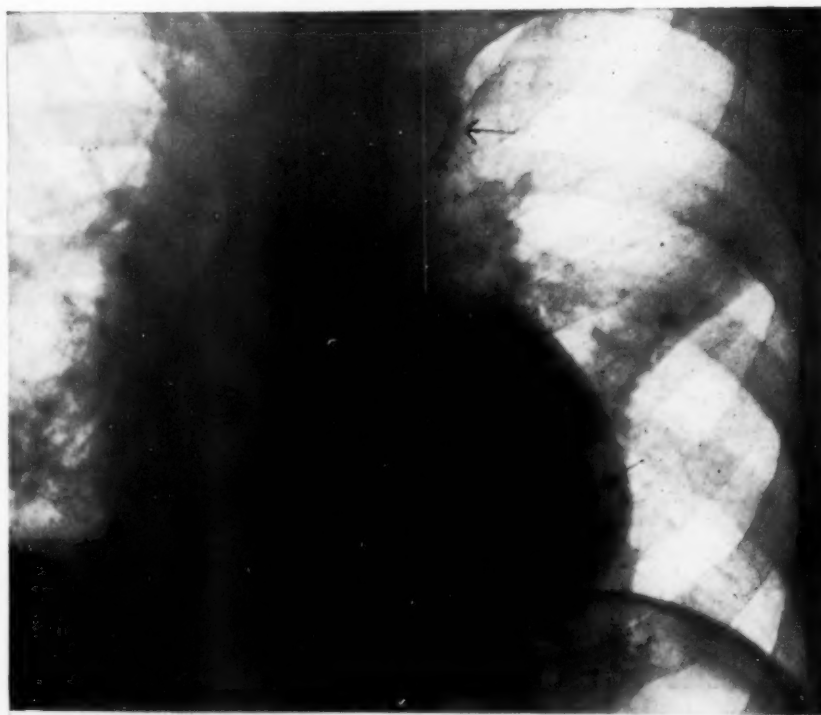


Fig. 1—Anteroposterior radiogram of chest, taken intra vitam, showing fine ring like shadow within the apical portion of the heart and oval shaped shadow within the aortic bulb.

Fig. 2—Oblique radiogram of heart region taken intra vitam, showing clearly the entire calcified area within the apical portion of the heart.

*Received for publication, March, 1924. From the Roentgen Ray Department of the Montefiore Home.

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of chronic emphysema, arteriosclerosis with moderate cardiac insufficiency, and bilateral inguinal hernia.

Roentgenological examination of chest on June 14th, 1917: Fluoroscopy showed marked diffuse fibrosis throughout median portions of both lung fields; hyperaeration of basal portions, low position and poor excursions of diaphragm; moderate enlargement of heart to left; superficial, at times irregular, left ventricular contractions; increased bulging of aortic arch. Plate findings: Fine ring-like shadow about 3.5 cm. at its widest diameter, occupying the apical portion of the heart; other oval shaped shadows within aortic arch (Fig. 1).

Roentgenological conclusions: Chronic fibrosis of lung; cardiac enlargement to left; suggestion of myocardial involvement; calcification of aortic arch; evidence suggestive of calcium deposits within the region of the apical portion of the heart, due either to calcification of the pericardium or of the heart proper.

Roentgenological reexamination on June 17th, 1917: Plates of the heart were taken with the aid of a small diaphragm, intensifying screens and instantaneous exposures, with patient in various postures. The entire calcified area in the region of the left ventricle could be demonstrated very definitely (Fig. 2). From the various plates taken at different angles it could be seen that the calcification must have solidly involved the entire apical portion of the heart.

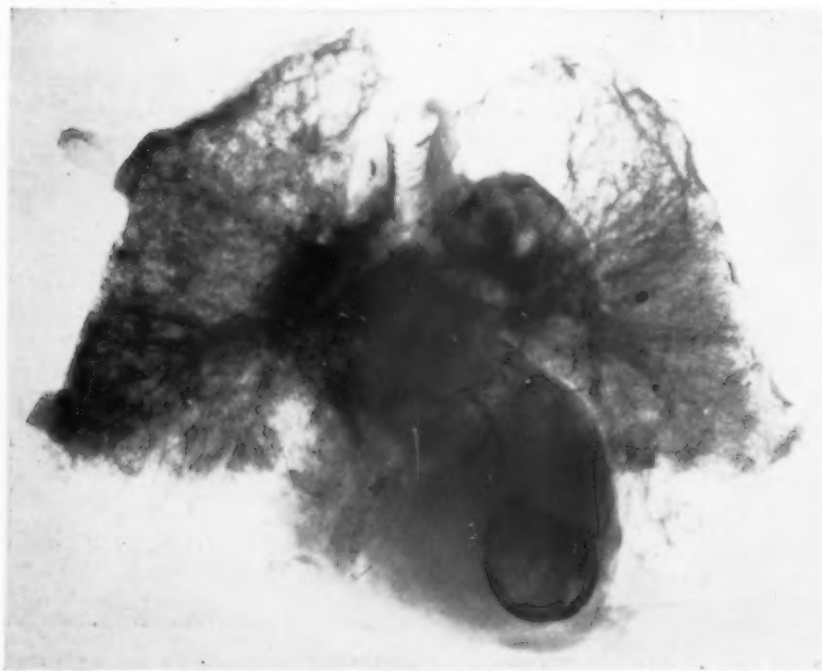


Fig. 3—Postmortem specimen, showing the calcification of the left ventricle, of the coronary vessels and of the wall of the aortic bulb.

Final roentgenological conclusions: Chronic fibrosis of the lung; calcification of the entire apical portion of the heart, calcification within the wall of the aortic arch.

Patient died a few weeks later from an incarcerated hernia.

Autopsy findings with regard to heart and aorta (autopsy performed by Dr. E. Boas): Heart weight 550 grams; somewhat enlarged; on palpation through the pericardium a very hard mass is felt over the entire apical surface; pericardium adherent by a few fibrous strands over anterior and left surfaces. Left auricle: endocardium white and milky; in anterior leaflet of mitral valve a small, hard calcified nodule. Left ventricle: in its lower half a cup-shaped area of complete calcification, extending 5 cm. from apex of anterior surface and 3.5 cm. on the diaphragmatic surface, and 4 cm. on interventricular surface; ventricular aspect of this calcified cup is irregular and marked by shallow depressions and elevations; otherwise it is evidently covered by smooth endocardium; external aspect covered by thin layer of fibrous pericardium and near its upper border by a few thin layers of muscle tissue. Coronary arteries are thickened to veritable pipestems; lumen of left coronary almost completely occluded, leaving a passage about the diameter of a hair. The aorta has a number of calcified plaques in its ascending and transverse portions. Microscopical notes may be omitted.

REVIEW OF ROENTGENOLOGICAL ASPECT OF CALCIFICATION OF THE HEART.

Roentgenological literature on calcification of the heart and its demonstration intra vitam is extremely scanty. There are only two previous instances on record in which a roentgen ray diagnosis of calcification in the heart itself was made during life time, namely the cases of Groedel¹ and LeWald². Unfortunately, however, in neither of those cases was an autopsy obtained so that final decision cannot be rendered as to whether the findings described by the two authors were due to calcification in the myocardium or pericardium. Therefore our case herein reported is the first one on record in which calcification of the heart itself was demonstrated roentgenologically intra vitam and in which the radiographic diagnosis was confirmed by autopsy. The cases published by Simmonds³ concern radiograms of autopsy specimens.

In contrast to myocardial calcification, roentgenological literature on pericardial calcification is quite abundant, as is shown by the publications of Rieder⁴, Schwarz⁵, Klason⁶, Mueller⁷, Weil⁸, Case⁹ and others. A similar case with autopsy findings was demonstrated by the author several years ago. Though it is not the purpose of this paper to deal with the x-ray findings in calcifying pericarditis, this subject must briefly be touched here for differential diagnostic purposes.

In cases where the calcifying process involves diffusely the entire pericardial sac, the calcified plaques within the anterior and posterior portions of the pericardium may or may not be shown on the usual front view plates, while the tangentially increased diameter of the calcified plaques along the lateral aspects of the heart will document themselves in form of dense, band-like shadows running just outside of and parallel to the heart shadow proper. In such cases a roentgenological diagnosis of pericardial calcification is justified. In cases where only the anterior or posterior portion of the pericardial sac is calcified, the usual front view plates may present round or ring-like or irregularly diffuse shadows within the heart shadow proper. In such instances, and if only front view plates have been taken, one is not justified in making a definite diagnosis of pericardial calcification, because there is in the appearance of such shadows nothing which would differentiate them from those cast by calcification of the heart itself. Yet

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one may even in such cases arrive at a certain degree of differentiation between these two conditions by taking plates with the patient in various postures. If the case is one of pericardial calcification one may thus obtain a certain view in which the pericardial plaque or plaques are struck by the x-rays tangentially and thus present themselves as the band-like shadows just outside of the heart area proper, as described above. Or one may, by means of the various views, succeed in demonstrating that the calcifying process, as in our case, involves the heart proper. It might therefore not be quite advisable and may even prove very misleading to interpret abnormal shadows within the heart area somewhat indiscriminately at one time as myocardial, at another time as pericardial calcification without having a justification, in form of postmortem control, for doing so.

Calcification within the bulbus aorta can be very easily diagnosed by the roentgen rays as is well known. Even calcified plaques within the descending aorta may be visualized by taking plates with the patient in oblique posture. They present themselves on the plate as narrow, somewhat lengthy shadows running just in front of the spine. Here too, apparently, only these plaques are demonstrable which happen to be struck by the roentgen rays tangentially, whereby the diameter of the individual plaque may be increased sufficiently to become demonstrable radiographically.

Large calcified areas within the heart muscle itself, as in our case, may be visualized by x-rays intra vitam. The use of double intensifying screens, small diaphragms, various postures of the patient and rapid, yet at the same time sufficient, exposures will aid in obtaining desirable results. Small, fine calcified foci, for obvious reasons, cannot be demonstrated during life time with our present machinery. Possibly we will be able to do so after a further development of the x-ray technique.

In postmortem specimens one is able to demonstrate by means of the roentgen rays the most minute calcified foci within the heart as well as within practically any other part of the body, as Simmonds has shown and as our own experience indicates. In the heart, for instance, it is advisable to slice up the specimen, to spread it apart and then to place it flatly on the plate. Soft tubes and slow developer should be used. As a quick and accurate localizer of small calcified areas or of any other small localized gross pathological changes such as produce radiographically sufficient differentiation of tissue densities, the use of the roentgen rays ought to be considered of very great importance for the pathologist, as shown by our own postmortem x-ray investigations which had been carried on on a large scale during the years 1914 until 1920. It is to be greatly regretted that comparative roentgenological and gross pathological studies are so rarely done by roentgenologists, because nothing is

more instructive and nothing is more valuable for the further development of radiodiagnostic possibilities than such work, especially so if it is combined with comparative studies of the clinical and intra vitam x-ray findings.

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9. Case: Pericarditis calculosa; *Jour. A. M. A.* 81:236, Jan. 27, 1923.

ABSTRACTS *and* REVIEWS

The Significance of Encephalography (Cerebro-pneumography) in the Diagnosis of Brain Conditions. W. DENK, M. D., Mitteil. a. d. Grenzgeb. d. Med. u. Chir. 36:9-28, 1923.

AFTER reviewing the main principles of the method as described and used by Dandy and Bingle the author gives his findings in 32 cases in which the procedure was applied. He uses only oxygen to avoid any possible air embolus, as according to Gaertner oxygen causes no gas embolus even when in the veins provided it is injected slowly to allow the red cells to take it up. An apparatus is then described which is

essentially the same as Dandy's. The point of puncture is very important. Lumbar punctures must be avoided in case of increased intracranial pressure as they are likely to be fatal. The right ventricle is chosen. The face is down, slightly turned to the left so that anterior horn of the right ventricle is lowest in position. A trephine is made about 2 cm. to the right of the bregma. About 14 c. c. is the normal ventricular capacity.

The reaction is more severe after lumbar puncture than after trephining. Later on the temperature rises slowly to 39° and reaches normal within two or three days.

The technique of exposure is the same as Dandy's. Anteroposterior, posteranterior and the two lateral positions are used. Fluoroscopy is of no great value.

The author gives the following schema from an article by Dandy, published in the *Annals of Surgery*, 1918, but he takes exception to some of Dandy's points.

The author objects to lumbar puncture, hence objects to Dandy's method which is used to determine whether the hydrocephalus is communicating or obstructive and which consists of injecting air through lumbar puncture then seeing whether any air reaches into the ventricles;

Hydrocephalus caused by	Diminished absorption of cerebrospinal fluid	Communicating hydrocephalus caused by adhesions in the subarachnoidal space.
		Obstructive hydrocephalus { Congenital atresia Adhesions Tumors
		Hydrocephalus externus
	Increased production of cerebrospinal fluid	Acute hydrocephalus—increased fluid due to meningitis or trauma
		Communicating hydrocephalus caused by occlusion of the vena magna Galeni

or injecting indigo-carmin or phenolsulphophthalein into the ventricles and finding its presence in the spinal fluid.

The author also takes exception to Dandy's statement that tumors are not the cause of communicating hydrocephalus; that only rarely when a tumor fills out the cisterna magna can a communicating hydrocephalus result from tumor. The author believes that a tumor anywhere in the cranial cavity, may indirectly increase the production of the cerebrospinal fluid either by stimulating the choroid plexus, or by compression of the venous return, or by lessening the absorption of the fluid, thus being the cause of a communicating hydrocephalus. Three cases with full data concerning the clinical, roentgenographic, and operative or autopsy findings are described to prove the author's contention. He concludes that in so far there is no definite evidence of tumors being the cause of communicating hydrocephalus, and it is to be further proven whether or not these are only exceptions.

In four cases of obstructive hydrocephalus, chiefly in young adults, three were produced by tumors compressing the aqueduct or the fourth ventricle. One tumor was in the middle fossa of the skull contrary to Dandy's idea that all are tumors of the cerebellum.

A few cases with full data, together with drawings of the roentgenological appearance of the air injected ventricles are cited to demonstrate the diagnostic value of changes in form or position of the ventricles.

In conclusion the author warns against technical errors which may mislead in the diagnosis and advises that control examinations be made in all cases.

A. M. Pfeffer, M. D.

The Erythema Dose of Radium. W. H. GUY, M. D., and F. M. JACOB, M. D., Arch. Dermat. & Syph. 9: 73-81, January 1924.

THE author's observations extend over a long series of cases. They summarize their end-results thus: "In no case in which an erythema

was not produced did atrophy or telangiectasia result. Furthermore, not all applications which produce erythema resulted in these changes. A fair percentage of 'erythema dose' however, or larger applications of gamma rays did result in atrophy and telangiectasia. We were with difficulty able to foretell the end-result of applications, knowing only that non-pigmented skin was likely to react unfavorably. Seemingly trivial erythema was at times followed by extensive ectasia and atrophic scarring, and on the other hand, strong reactions were at times not productive of undesirable end-results. The view that radium reactions may to a great extent be disregarded, we believe to be erroneous. However, we have gained the impression that erythemas produced by gamma rays of radium are less frequently followed by telangiectasia and atrophy than those produced by presumably similar quantities of roentgen rays. If this is true, it can probably best be explained on the basis of relatively greater absorption by the skin of roentgen rays than of gamma rays of radium. Erythemas produced by beta rays vary materially in their end-results. At times strong reactions with exudation and crust formation leave a practically unmarked skin; in other instances mild erythema produced by comparatively short applications produce unsightly end-results. We would urge, therefore, that caution be used in applying radium in any form to or through a skin surface to the extent of an erythema, lest undesirable end-results eclipse the unquestionably excellent results which may be obtained in selected cases with smaller dosage."

Relation of Roentgenology to the General Practitioner. C. HARVEY JEWETT, M. D., Clifton Med. Bull. 9:151-155, December 1923.

EVERY case of gastro-intestinal disease should be thoroughly studied from the clinical point of view before it is referred to the radiologist, otherwise, x-ray findings may prove misleading. Too frequently the clinician puts the burden of

proof upon the radiologist when the reverse should be the case; for example, a gross obstruction of the esophagus will be revealed by the usual barium meal but a beginning obstruction or an early filling defect will require a thicker meal to demonstrate its presence.

In studying the esophagus an obstruction may be easily demonstrated but the cause may be difficult to determine as it may be from a lesion along the wall or pressure from the outside. Often clinical evidence is the deciding factor. Negative findings are of no importance unless especial attention has been given to the esophagus and to the type of meal used. Early carcinoma of the esophagus may be very difficult of diagnosis as the only indication may be a roughened area where the barium sticks to the wall of the esophagus. A foreign body, such for example as a chicken bone composed mostly of cartilage, may show no evidence unless, perchance, barium clings to it.

The position, size, muscular tone and activity of the stomach are conditions easily recognized, but too often disturbances of muscular tone, peristalsis and mobility (important guides to treatment) are not considered at all. Syphilis of the stomach may closely simulate hour-glass stomach or even the filling defect of advanced carcinoma. The radiologist may recognize certain signs helpful in the differential diagnosis but the final diagnosis rests with the clinician.

The appearance of benign tumors may simulate that of malignancy but some of these may be easily differentiated by the x-ray. Eventration and hernia of the diaphragm may be confirmed by the x-ray. Diagnosis of congenital pyloric stenosis in infants may also be aided by the x-ray. Duodenal obstruction accounts for many of the chronic gastric conditions and may be recognized by the dilatation, stasis and reverse peristalsis of the duodenum. The x-ray offers practically the only means of diagnosis of this condition and the same is true of diverticulitis of the duodenum.

There is no doubt that improved technique and recognition of the indirect signs of gall-bladder disease have clarified the field and reduced the limitations of diagnosis. Single shadows may be difficult to distinguish from calcified lymph nodes, etc., but a group of ring-like shadows is suggestive, at least, of gall-stones, and if there is also evidence of enlarged gall-bladder with pressure on

the pylorus or duodenal caput, or evidence of adhesions distorting the caput or angulating the descending limb of the duodenum with a tender point over the gall-bladder region upon palpation, then diagnosis is almost certain.

The author believes that a positive diagnosis of gall-bladder pathology is not possible by means of the x-ray in the absence of other direct or indirect evidence. The x-ray helps but little in the diagnosis of diseases of the liver, although cysts and abscesses may be demonstrated both here and in the spleen. In the pancreas a tumor of the head or tail may be demonstrated by pressure deformities but that is about all the aid the x-ray can render.

Lesions of the jejunum are rather infrequent, except for generalized abdominal adhesions or tuberculosis peritonitis. Each of these gives suggestive and characteristic signs. Frequently disturbances of mobility of the barium meal in the jejunum suggest lesions in other parts of the gastro-intestinal tract. True obstruction here or in the ileum when caused by an annular carcinoma gives an area of marked dilatation with "herringbone" appearance. Even without barium such lesions are sometimes detected because of marked gas distension of the proximal segment which often assumes this herringbone appearance.

In the ileum these lesions are more easily recognized because of greater ease of palpation and in addition pelvic inflammatory conditions may produce marked adhesions. Pelvic tumors may also displace the barium filled coils of the jejunum and ileum.

Diagnosis of chronic appendicitis should never be made upon x-ray findings alone but if the appendix remains filled long after the cecum is empty one may be suspicious. Marked tenderness, fixation and evidence of surrounding adhesions make the findings more conclusive.

Stasis in the cecum and the colon may require an examination lasting three or four days. Position and form of the colon, stone, muscular activity, pressure of adhesions or obstruction can be readily made out.

In the presence of colitis or diarrhea it is important to know whether the entire colon or only a single area is involved. In tuberculosis and carcinoma there may result only local areas of hypermotility before any obstruction occurs. The ordinary barium meal cannot be relied upon to rule out a new growth in the colon. The barium enema should be used

after catharsis and cleansing saline enema, followed by rest.

Possibilities of Deep X-Ray Therapy. ROBERT E. FRICKE, M. D., *Therapeutic Gazette*, 48:10-13, January 1924.

THE problem of the field and effectiveness of high voltage x-ray treatment is as yet unsolved, says Dr. Fricke of the Howard A. Kelly Hospital, Baltimore. Results are, however, encouraging.

To the question, "Can deep x-ray therapy accomplish as much as radium in certain types of diseases?", he answers that in uterine fibroid tumors and in sarcomata the same results can be secured by radium as by roentgen ray but that if only a small amount of radium is available then the x-rays are preferable. In early cases of carcinoma of the cervix radium is supremely potent but in late cases it yields very poor results.

As to dosage, radium and x-ray dosage each require years of study to know just what dosage to apply, but in general he considers x-ray an inferior form of treatment when large quantities of radium are available. Roentgen ray is better if only a small amount of radium is available and roentgen ray treatment in conjunction with topical applications of radium may be of great value.

The most practical dosage recording instruments for roentgen ray dosage are said to be the following: Friedrich's Iontoquantimeter, the Dessauer Electroscop, the Fuerstenau Intensifier, the Seemann Spectrograph. All x-ray machines are unstable and should be standardized frequently.

Comparative Effects of Deep Roentgen Ray Therapy at Low and Very High Voltage. A Preliminary Report. JAMES T. CASE, M. D., *Jour. A. M. A.* 82:208, Jan. 19, 1924.

ONE of the new roentgen ray tubes perfected by Dr. Coolidge and capable of withstanding a continuous output of up to 50 ma. at 250,000 volts has been in use by this author since last summer. He has found that the time of application for any dose has been greatly shortened without prejudicing the results. One especially gratifying result is the diminution in both the frequency and severity of postirradiation sickness.

Orbital Changes Produced by Radium in Cancer of the Upper Jaw. ARNOLD KNAPP, M. D., *Jour. A. M. A.*, 81:1849-1851, Dec. 1, 1923.

AS A RESULT of radium post-operatively in cancer of the upper jaw there often develops a condition of the orbit which is similar to neoplastic involvement. After a study of this condition the author has decided that it is a different condition than the one resulting from the usual tumor growth and that the reaction of the orbit to radium treatment varies accordingly as the bony floor is intact. Symptoms are different than when caused by a neoplasm extending from the upper jaw.

Although it is possible to use radium in these cases its possible ultimate results upon the orbit must be kept in mind.

The Effect of Radioactive Radiations and X-Rays on Enzymes. (Pepsin.) RAYMOND G. HUSSEY and WILLIAM R. THOMPSON, *J. Gen. Physiol.* 6:1-5, September, 1923.

PEPSIN in solution is activated by the beta and gamma rays from radium emanation. The chemical effect has been studied quantitatively. The principles involved in this radiochemical action are the change in the logarithm of the concentration of active enzyme, varying directly with the variable W.

Some Observations on the Behavior of Lymphosarcomata Under Radium Treatment. D. J. HARRIES, M. D., F. A. C. S. and E. ROLAND, WILLIAMS, M. D., Cardiff, Wales. *The Practitioner*, London, 111: 291-294, October, 1923.

THE writer reports three cases of this lesion treated by radium. No mention is made of the technique used. In each case the growth receded, to reappear about a month later when it was much larger and proved refractory to a second radiation.

The observations of Loeper and Tonnet to the effect that radiation of cancerous lesions was found to have increased the total protein, the amino acids, the lipoids and the protein sugar of the blood serum are called to the reader's attention. The author suggests that perhaps the first effect of radiation is to kill a few cells in the vicinity of the tubes and that these are then attacked by tissue proteolytic ferments and the products of the action of these act as antigens, stimulating the defensive resources of the body to produce coagulins and lysins which extend their effect to other areas than the ones rayed (thus accounting for the simultaneous disappearance of growths other than at the site rayed). He suggests that these antibodies do not

persist but that the coagulins and lysins before disappearing from the blood produce anticoagulins and antilysins.

On the General Effects of Exposure to Radium on Metabolism and Tumor Growth in the Rat and the Special Effects on Testes and Pituitary. J. C. MOTTRAM, M. D., and W. CRAMER, Radium Institute and Laboratory of Imperial Cancer Research Fund. Quart. J. Exper. Physiol. 13:209-220, Nos. 3 & 4, November, 1923.

SMALL doses of radium emanation applied to young male rats for periods of about 40 days caused them to put on more weight than the controls and to become very obese. The tests showed intense atrophy of the seminiferous tubules and hypertrophy of the interstitial cells, also the pituitary showed changes in all three of its parts. Analyses brought out the following conclusions: The primary effect is atrophy of the seminiferous tubules; these shrink and allow the interstitial cells to hypertrophy and this action either directly or indirectly produces obesity. The obesity is not due to the elimination of the functional activity of the seminal epithelium. The rats rendered obese by exposure to radium were found to be more resistant to the growth of transplantable tumors.

Advantages of the "Loading Slot" in Radium Emanation Implantation. JOSEPH MUIR, M. D., Jour. Urol., 11:319-325, March, 1924.

This abstract is submitted by the author.

THE implantation of radium emanation "seeds" in connection with cystoscopy, and otherwise, has been practiced for a period of about ten years.

The technique employed can be stated as follows:

First. The fixing of the "seeds" in the point of the needle with vaseline.

Second. The introduction of the needle itself through the cystoscope.

Third. The implantation of the "seed" by means of the plunger.

Using the method outlined above, a considerable amount of time is consumed, as the implanter had to be completely withdrawn for each implantation. Because of this, visual observation was continually interrupted, and consequently the location of successive implantations was not only a matter of uncertainty, but the implantation of successive "seeds" in the same puncture channel was practically an impossibility. In other words, the exact distribution of

"seeds," and the amount of dosage was a matter of guesswork.

All these shortcomings are obviated by the use of my flexible radium seed implanter, with the "loading slot."

Using this instrument, a large number of "seeds" may be implanted in a much shorter space of time, with less traumatism, and with few portals of entrance.

The field of implantation may be mapped out with accuracy under constant visual observation, and successive "seeds" can be imbedded in the same puncture channel, to any depth, and at any interval with mathematical accuracy.

Therefore it is obvious that the flexible radium "seed" implanter provides the highly desirable factor of uniform distribution of radium emanation "seeds," i. e., radiation, and in addition avoids the former necessity of surface radiation. This latter supplemental radiation formerly had to be resorted to because of the possibility of mal-distribution.

This technique has been used in actual practice by some of our leading urologists and its merits are very apparent after a careful reading of the vividly illustrated article in the "Journal of Urology" of March, 1924.

Morphology and Cancer. PHILIP RICE, M. D., F. A. C. S., Cancer 1: 36-40, January, 1924.

CONSTITUTIONAL disease is primarily the product of a morphological structural defect and every functional process is therefore defective in a corresponding degree. This creates definite predispositions and susceptibilities, and curative results can be obtained only by complete removal of the primary morphological defect or by a regimen which by compensation nullifies its evil influence.

An individual whose vital organs are properly developed and correlated will have harmonious functions, meeting the demand of the whole organism and will have a resistance of the highest degree.

The author believes that the subject of human morphology must be mastered before the cancer problem can be solved.

The Medical Treatment of Cancer. L. DUNCAN BULKLEY, A. M., M. D., Cancer 1:44-56, January, 1924.

IN COMBATING cancer the author uses the following measures: (1) diet; (2) hygienic adjustment; (3) medical measures to place the organs of the body in a proper and right

condition to secure correct elimination and furnish a perfectly normal blood current.

He believes strongly in the effect of diet upon cancer and says that those who deny such relationship have not given the subject the proper or clinical study.

A suggestive diet is outlined, one which the author has used for years with hundreds of cancer patients. Sleep, fresh air, sunlight and regularity in habits are all insisted upon in treating his patients and the author says it is a rare thing for any of them to require opiates and that many of those whose cases have terminated fatally have died without pain and without the necessity for opiates. Internal remedies and local treatment are also used. These subjects are to be discussed in the next issue of "Cancer."

He Who Lives Wrongly Executes Himself. RUSSELL C. KELSEY, M. D., Cancer 1:40-44, January 1924.

THE old Roman proverb is here used relating to dietary mistakes. The writer very firmly believes that cancer may sometimes be aborted by the proper dietary treatment and cites four cases seemingly so aborted.

The Female of the Species as Such: And Cancer. S. W. LITTLE, M. D., Cancer 1:3-16, January 1924.

THE author's conclusions are based upon a statistical study of female deaths from cancer in the city of Rochester, N. Y. The data listed are the age of patient at time of death, parentage, total number of children borne by patient, total number of living children, location of cancerous growth.

He advocates the theory that motherhood is a powerful safeguard against cancer death at a comparatively early age and that normal motherhood is an even greater safeguard against cancer of the womb at any age. He says that women of 45 who have borne fewer than six children have necessarily more or less disordered female organisms, damaged beyond repair. The reason for this, he states, is that motherhood is a normal function involving less strain upon the organism than does repeated menstruation. The woman who menstruates more than 200 times between the ages of 25 and 45 has an overworked organism whose mechanism is damaged and whose resistance is thereby lowered.

Heliotherapy and Joint Tuberculosis.

ARCHER O'REILLY, M. D., F. A. C. S., J. Missouri M. A., 21:39-41, February 1924.

EXPOSURE of the entire body to the sunlight and the fresh air constitutes one of the most energetic of excitants and tonics.

The action of the sunlight is both direct and indirect, however, little is known of its direct action. The ultraviolet rays and the infrared rays have a bactericidal value, but the ultraviolet rays do not penetrate the skin to any great depth, the infrared penetrate farther.

The indirect action is better understood. The violet and the ultraviolet cause erythema and pigmentation and are absorbed by the capillaries of the skin. Pigmentation protects against excessive violet rays and regulates the thermic factor. The writer believes that the pigment probably receives, supplies, and increases the activity of the elements essential to the metabolism of hormones. The radiant energy absorbed by the blood hastens the intracellular process of oxidation and reduction, thus modifying the whole metabolism. Circulation is increased and the musculature becomes firmer, hemoglobin is increased, internal secretions are accentuated, digestive functions become regular and there is noted a psychic change in the patients.

Heliotherapy can be used wherever the sun shines. It can be used in the home as well as in the institutions. It must be kept in mind that the rays can not be transmitted through glass but must come through direct exposure.

The author describes the technique of heliotherapy as used at the county branch of the St. Louis Children's Hospital where the majority of cases are those of tuberculosis of the spine or the hip.

Influence of Ultraviolet Irradiation on Calcium Content of Blood Serum in Hay Fever, Hyperesthetic Rhinitis and the Astmas: A Preliminary Report. FRANK J. NOVAK, JR., M. D., and ABRAHAM R. HOLLENDER, M. D., Jour. A. M. A. 81:2003-20007, December 15, 1923.

IN hyperesthetic rhinitis the ionic calcium content of the blood serum is invariably low; it is also low in certain cases of hay-fever and asthma. Calcium alone does not influence these conditions but calcium lactate combined with thyroid extract affords temporary relief in all cases of hyperesthetic rhinitis and in some cases of hay fever and bronchial

asthma. As to ultraviolet irradiation it was found that together with combined calcium thyroid-therapy it, apparently, permanently fixed the ionic calcium content of the blood serum.

High Frequency Currents: Their Use in Office Practice. CORA SMITH KING, M. D., Medical Woman's Jour. 31:5-11, January 1924.

IN using high frequency currents certain cautions should be observed. The author gives the following:

1. "Keep smoothly polished the prime conducting rods and muffler, if one is used to cover the spark gap. This caution is of first importance from the mechanical standpoint, as any accretion tends to short circuit.

2. "Keep the electrodes from touching each other at the edges, thus prevent a short circuit and a burn. The clips fastening the cables to the plates must be secured against slipping off, which would concentrate the current at the tip of the cable end and burn the skin. Rolling the edge of the flexible metal plate holds the clip in place.

3. "In case of persistent pricking under the patient's plate-electrodes in diathermia, in spite of careful lathering of the skin and the plates, and of contact being assured by uniform pressure of sand bags, think of a possible hidden break in the conducting cables between the machine and the patient. Substituting new cables obviates this difficulty. Prickling along the edges of the plates is caused by sharp edges. This can be avoided by folding the edge away from the patient or by placing a paper towel under the edge.

4. "To bind the metal plates upon an extremity, use elastic bandaging to allow for slight expansion from increased blood to the part. If a tight bandage is used it becomes painful before the treatment is over.

5. "In diathermia never use a wet felt pad. These pads, recommended by some manufacturers, are undesirable; first, because they change the character of the treatment by causing steam to form, resulting in a superficial hyperemia; second, because there is danger of a burn in long continued treatments when the compress may dry out except in small areas, where fulguration may then occur from concentration of the current. The only electrodes to use in diathermia are bare metal plates applied directly to the skin, the contacting surfaces being liberally lathered. The patient's own perspiration will thereafter maintain the necessary moisture.

6. "Never use the old type of glass vacuum tubes in cavities such as the vagina or rectum, on account of danger from explosion.

7. "Diathermia, although of great value in the treatment of tuberculosis, must in advanced cases, be begun in moderate dosage, to guard against hemorrhage caused by a too rapid absorption of scar tissue. The strength of the current in these cases should be only about 600 milliamperes for the first few treatments, gradually rising after the first week to 1200 or 1500 milliamperes."

X-Ray Treatment of Pertussis. R. R. STRUTHERS, M. D., Canad. M. A. J. 14:141-142, February 1924.

THE author presents 45 case reports of patients roentgenologically treated for pertussis. All cases were definite, clinical cases. The patients' ages varied from three months to 30 years and the duration of the disease varied from two days after manifestation of spasmodic symptoms to eight weeks.

Most of these patients were treated by a large single exposure, the larger the dose the better were the results, seemingly, the author says. There were seven prompt cures, the results being striking; 20 cases were greatly benefited and 18 showing no appreciable change. The treatments most effective were those which took place before the third week of paroxysms. There were two deaths from bronchial pneumonia in the series. One patient had the disease before treatment and the other developed it five days afterwards. Two cases had relapses of pertussis. The author regards the series as too small to be conclusive but as giving sufficient reason to believe that the rays are of benefit.

Endothermy in the Treatment of Accessible Neoplastic Disease. GEORGE A. WYETH, M. D., Ann. Surg. 79:9-19, January 1924.

LACK of standardization of apparatus and technique, vague nomenclature and the practice of endothermy by specialists in other fields who have no leisure to develop skill outside their own specialty—all this has led to a waste of time and worse. Before a man can command success in treatment by a high frequency current he must be very wise in the current's prescription and expert in its application.

Dr. William L. Clark is quoted as saying, "Desiccation devitalizes by drying the tissues; fulguration shocks and produces hyperemia but does not destroy; high frequency cauteriza-

tion is essentially the same as the ordinary cautery though perhaps deeper in effect Desiccation destroys tissue without opening blood or lymph channels and will act as styptic when there is oozing of blood." George E. Pfahler has said: "Fulguration is never used to destroy tissue. If the profession will get that one fact clear we shall have much less confusion in our literature."

It would be reckless to treat every case by one method. Doubtless the best hope for the patient lies in the surgeon's knife but the author includes endothermy under surgical attack in accessible cases. Both x-ray and radium will accomplish many of the results of endothermy but not so quickly nor so surely as will the last.

The three important neoplastic diseases are tuberculosis, benign and malignant growths and syphilis. Old chronic, ulcerated, specific lesions many times will yield quickly to endothermy.

The greatest field for endothermy, however, is in the treatment of accessible malignancy and precancerous conditions. It is almost a specific in the treatment of tuberculous diseases of the skin and mucous membranes. It is quick, clean, accurate, reduces the danger from metastases and recurrence, and results in rapidity of convalescence and good cosmetic results.

What Actinic Rays Will and Will Not Do. T. HOWARD PLANK, M. D., J. Am. Inst. Homeopathy, 16: 332-335, October 1923.

THE rays will not take the place of surgery though they often will remove the necessity for a surgical operation. They will not remove pus but they will hasten healing after drainage. They are not a treatment for the cure of cancer, however after surgical removal of the growth they may aid in the restoration of tissue. They are of proved value in the treatment of tuberculosis. Bacteria in the open are destroyed by the direct action of the rays, and they may be destroyed also by the action of the rays through several centimeters of tissue, but in deeper tissues the rays are not bactericidal except indirectly through an improved blood stream. They are of value in most infections. They produce both local and systemic effects, they may be used so as to stimulate or soothe. They are of value in secondary anemias.

Every actinic ray treatment should be preceded by a ten minute treatment of radiant light in order to

bring the blood to the surface where it can be acted on by the actinic rays.

Thoughts on Present Day Medicine and the Future Possibilities of the Physiotherapist. FRANK E. PECKHAM, M. D., Providence, Rhode Island. Am. J. Electroth. & Radiol. 41:315-319, October 1923.

CRITICISM kills ambition and kills human beings. The medical profession as a whole criticises each other unmercifully. There should be more unison, more love for one's coworker, more tolerance for other methods than one's own.

When the time comes that all methods are brought into proper relationship disease will be treated in its earliest manifestations but the majority of medical men of today are not trained to recognize such conditions. They recognize only an established pathology, but the time is coming when the medical man will be trained to recognize incipient pathology.

The author suggests along this line that the gross physiological processes and the nervous mechanism should be studied so that the medical man of keen observation could map out mentally the various reflexes and get at the center of the disturbance. This diagnosis could then be checked up by physical examination and laboratory tests.

Multiple Neuritis: Its Differential Diagnosis and Treatment. WILLIAM MARTIN, M. D., Am. J. Electroth. & Radiol. 41:387-392, December, 1923.

MULTIPLE neuritis is not a rare affection, it simply has not always been recognized. A careful study of the symptomatology and history will usually make the diagnosis clear. Such conditions are amenable to physical measures and correct prognosis hinges upon correct diagnosis. Clinical diagnosis is discussed and the outline for physical treatment is given as follows:

First a body irradiation by use of an air cooled quartz mercury lamp should precede local treatment. This will build up the metabolism and general circulatory conditions.

The static wave current is then used, the electrodes over the usual points regularly treated in sciatic neuritis. This will produce an aggravated soreness for a few days, of which the patient should be forewarned. In unusually weak cases it is well to stop the static treatment for a day or two and to use the high

frequency current, applying a metal plate electrode large enough to cover both lumbosacral areas, and a metal cuff just over the toes is used. The current is given to tolerance twenty minutes through one leg, then twenty minutes through the other. The amperage will vary with the patient, usually less than 1200 ma. answers. This treatment will alleviate soreness and pain and the wave current can be used again and soon depended upon entirely. The lower dorsal and lumbar spine is usually given a fifteen minute seance of wave current applied by the spinal electrode, a long slow spark being used.

After the neuritis pain is lessened or eliminated the galvanic sinusoidal current is used, pads over each sciatic notch, and the active pad bound securely to the foot. Treatment is given for twenty minutes over each leg, but old or weak patients, may not be able to endure so long a treatment.

Medical Diathermy. F. HOWARD HUMPHRIES, M. D., Am. J. Electroth. & Radiol. 41:323-326, October 1923.

THE author finds this mode of treatment of much value in high arterial tension. The same modality is useful in pneumonia, tuberculosis, gout, anemia and supralimation. No one should give treatments for these diseases, however, unless he has had training in the technique necessary. The author recommends a fair trial of this form of treatment in tuberculosis, as symptomatic relief is offered and cure, he thinks, might possibly result.

Electrotherapy: Or What the Physician Can Do and Should Do for "Chronics." JOSEPH E. G. WADINGTON, M. D., J. Michigan M. Soc. 22:273-275, June 1923.

THE chronics, says the author, are always with us and are considered as liabilities, not assets. To the average practitioner the "chronic" is a synonym for the "incurable" and the physician's hopeless attitude toward these patients drives the patients to the "blind leaders of the blind" who often accomplish an apparent cure, often relieve, and sometimes happen to really cure a patient. "If the physician will refer his impossible and unappreciated chronics to the electrotherapist, the same as he refers his eye cases, surgical and other specially indicated cases to the respective specialist, he will not only convert disgruntled patients into grateful ones, but will be able to retain such patients as assets in the

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future; he will thereby fail to act as a constant feeder for irregular practitioners of the healing art, and failing sustenance these latter must eventually die of clientele insufficiency."

Ultraviolet Waves in Diphtheria Carriers. HARRY EATON STEWART, M. D., Am. J. Electroth. & Radiol. 11:396-400, December 1923.

THE success of Dr. Leo C. Donnelly of Detroit, Michigan, and that of Dr. Floyd C. Turner in the U. S. Marine Hospital, No. 21, New York, in using ultraviolet light to destroy the organisms of diphtheria in the throats of diphtheria carriers is recounted. Following this the author gives his own experience and the conclusions drawn are that results are very much better with this treatment than they are from any other, the method being quick and efficient.

Technique: "The water cooled 220 volt burner was used on the ordinary 110 volt current. Five minutes were allowed to elapse after the burner was turned on before the treatment was begun, sufficient time to attain maximum capacity. The intensifier was then turned on. With the compression $\frac{5}{8}$ " applicator, contact against each tonsil was maintained for one minute. After several of these treatments there occurred in a number of the patients a white discoloration of the mucous membrane, the size and shape of a quartz tip. These produce no pain or other untoward symptoms and disappear spontaneously in about two days. Later a blunt quartz applicator was used for the nose and pharynx. The patients easily become accustomed to the treatment, and those who had at first hypersensitive palates became less sensitive, so that the applicator could be moved all around the throat, introduced between the soft palate or down toward the epiglottis without producing gagging. This general raying of the throat was done for about two and one-half minutes daily, the nasal applicator inserted as far as possible into the nares, left one minute and slowly withdrawn."

Seven patients soon received three negative cultures two days apart and were discharged. The other cases were given continued treatment as just described but alternated every other day by the application of 2 per cent mercurio-chrome swabbed onto throat and nose. Cases soon gave negative cultures. No treatment was given for at least 12 hours preceding cultures.

The author suggests therapeutic treatment of diphtheria cases by the regular means of antitoxin followed by ultraviolet treatment to shorten the duration of disease and to minimize its effects.

Cases Illustrating Certain Problems in Focal Infection. RUSSELL L. HADEN, M. D., M. Clinics N. America, 7:1109-1117, January, 1924.

THE author discusses findings in four cases of infection each of which was traceable to infected pulpless teeth.

The first case was that of a young man with acute pyelonephritis. He had only one pulpless tooth in which the radiograph revealed some decay under the inlay but no bone absorption. A culture from the tip of the extracted tooth resulted in many colonies of non-hemolytic streptococcus. Two rabbits injected intravenously with 5 c. c. of a broth culture of these organisms developed suppuration and hemorrhagic conditions of the kidneys with lesions of joints and vegetations on the heart valves. Complete clearing of the infection followed extraction of the offending tooth. The author calls attention to the fact that radiographic findings cannot be translated into terms of numbers of bacteria, and that the greatest systemic damage can be done in a time when the radiographic findings are still negative.

The second case was one of recurrent attacks of iritis with a history of repeated arthritic attacks. Tonsils and suspicious teeth had been previously removed. A radiograph showed an area of rarefaction with a small sequestrum in the socket of a tooth which had been removed six or seven years previously. Cultures from that lesion brought a profuse growth of non-hemolytic streptococci and their injection into the rabbits produced bilateral iritis. The author points out that the removal of offending teeth alone is insufficient, that the infected granuloma must not be left over in the socket.

His third case was that of onychia in two fingers with history of attacks of iritis and pvelitis. Radiographs revealed several pulpless teeth, and frank pus could be expressed from the tonsils. Cultures from the teeth, as well as from the tonsils were injected into rabbits which developed swelling around the nail roots of the fore feet.

The fourth case was especially interesting as it points out the fact that out of three possible foci of infection only one acted as the source

of the infection. It was a case of recurrent peptic ulcer which cleared up under suitable gastric treatment and the removal of three pulpless teeth showing in addition some rarefaction about the roots. Cultures were made from each one of the teeth and injected into three different rabbits. Only one produced multiple hemorrhages in the gastric mucosa and actual ulceration in areas. Three other animals injected with the same active culture showed identical lesions. The other two cultures were apparently harmless.

Rosenow's theory of selective action of bacteria on certain tissues appears to be well illustrated in these reports.

A. M. Pfeffer, M. D.

Radiography for Children. PHILIP R. THOMAS, D. D. S., Oral Hygiene, February, 1924.

MUCH valuable information relative to the stage of development, time of eruption, and position of developing teeth can be obtained from well taken radiographic plates. Before any deciduous tooth is removed a radiogram should be taken to determine whether a permanent tooth is developing. In some cases of missing permanent teeth the deciduous premolars may be valuable for years if left in place. Also before any orthodontic treatment is begun an x-ray of the developing jaw should be taken.

Clinical evidence of mal-nutrition first shows on the tooth pulp and can often be detected here by a clear plate of a six year molar in the infant jaw showing atrophic enamel conditions as the result of mal-nutrition or of rachitis.

Radiography as an Aid to Diagnosis in Orthodontia. IRVING SPENADEL, Internat. J. Orthodontia, 9:362-372, November, 1923.

RADIOGRAPHY of the oral cavity is not a positive means of diagnosis but is of great value, nevertheless, "in that the operator can determine prior to treatment the amount of success obtainable or the amount of failure he may anticipate. There are some cases where it is desirable to radiograph the skull in order to determine true conditions of the sella, for either an enlargement of the hypophysis or some cranial pressure responsible for overdevelopment of the mandible; and to decide whether it is more practical to send the patient to some specialist better skilled to treat that abnormal condition than to immediately proceed with orthodontic measures and

have regrets afterwards. It may be advisable in many of these types of cases not to treat them orthodontically, as the prognosis is poor (and failure will reflect upon the poor judgment of the operator.)"

Radiography in Intracranial Tumors (Excepting Those of the Hypophysis). DRS. DELHERM and MOEL KAHN. *La Presse Medicale*, 16: 93-95, Jan. 30, 1924.

ALTHOUGH the localization of an intracranial tumor is a very difficult proceeding it is by no means a hopeless one. Sometimes radiography clears up the difficulties beautifully, although of course it is the exception to get as clear a plate as in many other types of diagnosis. There are many helpful signs pointing the way to diagnosis even in the absence of a clearly depicted pathology. Some of these signs are erosion of the bone and of the internal table in particular, modifications of the morphology of the sella turcica under the influence of a tumor in its vicinity, also a widening of the sutures, particularly in children. These deviations from the normal although they require a delicate interpretation constitute a precise means of diagnosis in many cases.

Radiography of the Sphenoid Sinuses and the Ethmoid Cells. E. GACHOT, M. D., and G. WOHLMEYER, M. D., *La Presse Medicale*, 16:170, Feb. 23, 1924.

THE simple instrument described is used intraorally and its use results in better pictured detail than do the ordinary methods. The plates show a clear picture of the sella turcica, of the sphenoid and ethmoid sinuses in juxtaposition. The septum appears as a very dark line through the center of the plate. The turbinates appear as more or less curved or elongated lines in the nasal canal and are easily demonstrable. Very often hypertrophy of the lower turbinates causes a shadow which by its homogeneity and shape is clearly distinguishable as such. The ethmoid cells are clearly shown.

The value of the method lies in the fact that it reveals the details of the pathology present, thus serving as a guide in surgical intervention. The instrument described is sold by MM. L. Drault & Ch. Raulot Laporaite, Paris, Rue Dutot 73.

Early Diagnosis of Bronchial Pneumonia in Children. FORRIS E. CHICK, M. D., *J. Am. Inst. Homeopathy*, 16:346-353, October, 1923.

BY MEANS of x-ray the author was enabled to make a positive diagnosis in 60 per cent of the doubtful cases in a series of 55 cases, and this within twenty-four to forty-eight hours before clinical examination of the most careful kind could show it. These obscure cases are often regarded as acute bronchitis or capillary bronchitis but the author believes they are more often cases of mild bronchopneumonia.

Roentgenographic Pelvimetry. W. R. MACKENZIE, Surgeon Samaritan Hospital for Women, Belfast. *Brit. M. J.*, 2:975-976, Nov., 1923.

COLLABORATION between roentgenologist and physician provides a valuable means of conserving the life of both mother and child.

The author has not found it possible to recognize the fetus until the fourth month of pregnancy, and then only that part of the fetus over the inlet. During the preceding months the thickness of the maternal tissues, the hypercongestion of the uterine walls, the amniotic fluid and the slight density of the fetal bones combine to prevent demonstration of the latter.

Overlapping of the skull bones can be recognized during the first stages of labor. If engagement is impossible there will be seen overlapping of the fetal skull of the pelvic inlet, especially in the region of the symphysis pubis. The necessity of Caesarian section can thus be determined before it is too late. The author says that even though the relationship of the fetal head to the maternal pelvis is found to be satisfactory there is still the question of the exact mobility of the fetal bones.

Pelvic measurements should be taken in the early stages of pregnancy as later on the outlines may be obliterated. Employment of the technique here given obviates any error as to size. Heretofore this has been a difficulty and the difficulty lay in the fact that the sacrum and pubis were at different levels from the sensitive plate, hence one portion of the pelvis was enlarged out of all proportion to the others. The short exposure works no harm to either the mother or child.

The author thus describes his technique: "The patient lies with her face downward on the table with the symphysis pubis touching the plate carrier. The x-ray tube is raised two feet above the plate and focused on a point four inches below the mid-point of a line joining the posterior iliac spines; this point corresponds to about the middle of the coccyx.

The tube is then tilted forward through an angle of 30 degrees, towards the patient's head, and it will then lie parallel to the plane of the pelvic inlet. The rays will thus be directed upwards and forwards in the axis of the true conjugate and an excellent image of the pelvic cavity will be obtained on the plate.

"In this technique there are three constant factors: 1. The point of focus. 2. The x-ray tube at the same angle to and at the same distance from the sensitive plate. 3. The relation of the symphysis pubis to the sensitive plate.

"Having these three fixed points and using the shadow of the symphysis pubis as an axis we can accurately measure any object within the 'tube radius.'

"The possibilities of error in interpreting the size of the inlet, because of the varying degree of tilting of the different pelvis, are negligible in this method of pelvimetry. In a contracted pelvis the angle which the plane of the pelvic inlet makes with the horizontal is greater than the normal, and the angle to the vertical will be correspondingly reduced. In a contracted pelvis the promontory of the sacrum will be nearer the plate than in the normal and be more easily defined."

The method of measuring is thus given: "In a normal pelvic bone, which is designated the 'standard pelvis,' the various diameters both external and internal, are accurately measured. When this bone is radiographed definite points can be marked on the plate; the distance between these points will bear a definite ratio to that between the corresponding points measured on the pelvis. This radiograph is taken as the 'standard plate.' By radiographing the patient in the same position as the 'standard pelvis,' an accurate comparison of the patient's plate with the 'standard plate' will be obtained, and therefore of the patient's pelvis with the 'standard' or normal pelvis: from it the internal measurements can be mathematically worked out. When compared with the direct measurements they are fairly accurate. To work out mathematically, for example, the transverse diameter of the pelvic inlet, the length of the transverse diameter of the pelvic radiograph of the patient is multiplied by the transverse diameter of the standard pelvis, and divided by the transverse diameter of the standard plate. In the same way the anteroposterior diameter of the inlet, or the transverse diameter of the outlet can be worked out. I have not

mentioned the oblique diameters, but if the true conjugate is diminished the oblique will also necessarily be reduced in proportion."

The Effect of Radium Upon the Ovary. HARVEY BURLESON MATTHEWS, M. D., F. A. C. S., Surg. Gynec. Obst. 38:383-392, March, 1924.

CONCLUSIONS are drawn from an experimental, pathological and clinical study of the subject. The study included experiments upon rabbit ovaries, a pathological study of human ovaries that had been exposed to radium and a study of the data upon all available cases of pregnancy following the use of radium, data being secured from colleagues from all parts of the country.

The author believes it reasonable to believe that pregnancy may occur and delivery be normal after the usual dose of radium used to regulate non-malignant uterine bleeding. If more than 600 to 800 mg. hrs. are used, however, fertility will probably be destroyed. Age is an important factor also, as younger subjects can withstand treatment that less active subjects could not withstand.

The tendency to abortion is slightly more common following the use of radium, the ratio of abortions to normal labor in the series was 1:2.6 whereas the normal ratio in the United States is 1:3 or 4.

Offspring do not seem to show any untoward effects although they were occasionally somewhat below normal physically but it could not be said to be due to the radium.

Only those gynecologists and obstetricians who have had special training in radium therapy should employ it for affections of the female reproductive system. Its indiscriminate use will bring discredit upon radiotherapy.

Problems in the Treatment of Carcinoma of the Breast. HOWARD A. KELLY, M. D., F. A. C. S. and ROBERT E. FRICKE, M. D., Surg. Gynec. Obst. 38:399-402, March, 1924.

ALL suspected breasts should be examined with minute thoroughness, including the axillary and the supraclavicular areas. An x-ray plate of the chest is a matter of routine in the authors' examinations for the reason that very often a small tumor of the breast is found to have pulmonary or mediastinal involvement. If the patient is a good operative risk the authors favor operation and immediate microscopic section before going on with a radical

operation, which is the one they favor. Ten days after the operation a heavy radium treatment is given using five or six equidistant portals along the line of incision and "a gram at one-quarter of an inch filtration applied for 10 to 12 minutes to each." The axillary and supraclavicular areas are also radiated, giving two inches, the equivalent of five or six grams for an hour. This latter demands great care and the package must be accurately adjusted and the surrounding skin protected with heavy lead, which will also prevent slipping of the pack. "Just as the surgeon develops an 'aseptic conscience' so must the radiologist acquire a strong 'protective instinct.'"

After being discharged from the hospital the patient should be observed at gradually increasing intervals for several years and if recurrences appear they should be treated with radium.

The author does not have much faith in the value of preoperative treatment.

It is hopeless to radiate pulmonary metastases but metastases to the spine are often helped in a remarkable and unexpected manner by heavy treatments which serve to alleviate the pain and often enable the patient to live a year or two longer in comparative comfort. In some of the authors' patients there has been an evident deposition of new bone with resumption of the normal relations of life by the patient, "almost a resurrection," the author says.

Large inoperable breast cancers may be treated by implantation of tiny glass spicules or radium emanation in addition to external applications. This treatment will alleviate pain, retard ulceration and sloughing and delay the final outcome for a year or two. Radium treatments of inoperable growths are always painless.

Technique improves from year to year and more may be expected of radium treatment during the next few years. At present, results are not brilliant but one must take into consideration the fact that most cases come to the radiologist only after everything else has failed, including the quack. And here the author states that radium in inexperienced hands is quasi-quackery.

Röntgenology of the Male Urethra: Notes on the Anatomy, Physiology and Pathology. VERNE G. BURDEN, M. D., Surg. Gynec. Obst. 38:403-406, March, 1924.

THE author modifies Haudek's method by keeping the opaque

solution flowing through the urethra into the bladder during the entire time of exposure, because if the urethra and bladder are merely filled and the external orifice is sealed before exposure the posterior urethra will cast no shadow, since it is empty. A five per cent solution of silver iodide has proved most satisfactory in the author's work.

This method should not be used immediately after cystoscopy and neither should too great force be used in injecting the solution because there will then be danger of extravasation if the urethra is diseased. In no place will this method take the place of direct inspection through the urethroscope if the latter can be used.

The fluid always meets resistance at the distal entrance to the posterior urethra and then passes into the bladder. The posterior urethra can be definitely located between the bulbous expansion and the outline of the base of the bladder and appears in the roentgenogram as a very narrow shadow connecting the two parts.

Regardless of the degree of extension of the bladder this narrow streak from the posterior urethra joins the base of the bladder at a right angle. These observations, the author believes, indicate that the posterior urethra is normally in a state of constant tonic contracture and closure and maintains the closure in spite of a distending force on either side. Also, the posterior urethra never becomes a part of the bladder, creating the so-called vesical neck, even though the bladder is fully distended. The entire length of the posterior urethra helps "in maintaining the closure of the bladder, there being no evidence of an internal and an external sphincter with separate and independent functions."

A Standardized X-Ray Technique in Urological Examinations. JOHN W. MARCHILDON, M. D., J. Urology, 11:83-94.

IT IS quite possible for the urologist to become familiar with the technique required for successful radiography of the genito-urinary tract and this knowledge is a necessity to the present day urologist because diagnosis with the cystoscope alone is not possible.

This paper gives the technique very clearly and in minute detail.

Further Contributions Concerning the Formation and Structure of Gall Stones. B. NAUNYN, M. D.,

Mitteil. a. d. Grenzgeb. d. Med. u. Chir. 36:1-8, 1923.

THE author begins with a short resume of his previously formulated views concerning the subject. These views are the following: (1) Gall stones arise in a condition of infectious cholangy either ascending from the duodenum, or descending hematogenously. This lithogenetic cholangy may never become a real cholangitis, or it may heal completely with or without stone formation. (2) Formation of calculi under sterile conditions is improbable. (3) Rarely do stones form from cholesterol crystals, or grow by their addition. The growth of stones is due to adhesion or absorption of magma consisting mainly of uncrystalline cholesterol with more or less strong augmentation of calcium of bilirubin. Crystalline formation within the stone is a product of secondary cholesterolization. The influence of hypercholesterinemia and hypercholesterinocholia on the rise of gall stones is doubtful. On the other hand it is quite certain that calculi draw much of their cholesterol from the epithelial cell layers of the bile ducts.

The author then discusses the small intrahepatic biliary concretions. These are hard, semi-rounded, at times cylindrical or angular in shape, and even soft and globular bilirubin-calcium granules. They have been found in the smallest intrahepatic ducts as in the inter-acinous subcapillary branches. From their original site they may be moved and brought into the larger ducts and from there get into the gall bladder where they often become the central nucleus of a stone.

Some stones have been observed to consist of an aggregation of such small granules. Also these small concretions arise under conditions of infection. Chemically they consist of bile pigments and their derivatives up to bilihumin, and their calcium compounds. Much bilirubin and biliverdin can be obtained from them, and their content of calcium is much greater than that of bile, suggesting their formation from an increased secretion of mucin caused by infection. It is also noteworthy that they contain only mere traces of cholesterol. In two slides of such concretions the author was able to detect a cast of an epithelial layer.

The remaining portion of the paper is devoted to the discussion of the role of the cholesterol microscopic rhombic crystals in the structure and formation of the larger, gall-bladder calculi. Cholesterol

microrhombs are found in various serous and pus exudates, in cystic fluids, etc. While they cannot be seen with the naked eye their presence is betrayed by the glistening appearance of the fluid. In no fluid where they are found in large quantities is there any tendency to formation of calculi except perhaps in the prostate. Of their role in gall stone formation little has been known. Only in very few cases could they be demonstrated in the stones, although this may be due to technical difficulties in preparing slides, as in two cases where the author was fortunate in obtaining proper slides their presence was demonstrated. But it is striking that these microrhombs are not found in the pure cholesterol stones, but rather in the dark reddish stones rich in bilirubin-calcium. They are usually found as a coating on the surface and also in various sections of the stone. At times there is a compact arrangement of these crystals with one another, at others they are sparsely and irregularly scattered throughout the calculus. As free crystals within the bile they tend to gather on the mucous surfaces of the gall bladder, or on already existing stones, and becoming cemented together by bilirubin-calcium they form membranes with which the stones become coated. A number of times calculi of amber-yellow color (not reddish), were similarly observed to consist of an external portion where the microrhombs were easily seen, with an internal portion which consisted of uncrystalline solid cholesterol. The author arrives at the following conclusions:

The cholesterol microrhombs which are free and in large quantities in the bile form coatings after becoming cemented together with bilirubin-calcium. The calcium required for the purpose is obtained from an increased mucus supply due to an infectious process together with some other factors such as change in reaction, etc. Yet, it must be conceded that bilirubin-calcium is not the only cementing material as is proven by the fact of the layering of these microrhombs in the amber-colored calculi which are not reddish, and therefore not containing bilirubin-calcium.

(Note: The x-ray appearance of some stones and the lack of visibility of some others are facts well explained by the author's views expressed in this paper. A. M. P.)

A. M. Pfeffer, M. D.

Roentgen Aid in the Acute Abdomen. D. Y. KEITH, M. D., Southern M. J. 17:98-117, February, 1924.

A LIFE can often be saved by making a roentgen examination previously to an operation upon an acute abdomen. In many cases invaluable information is obtained without the use of barium. A reticulated appearance of the small intestine with its feathery outline is so characteristic that it cannot be mistaken and together with dilatation is a positive proof of obstruction.

All postoperative cases with symptoms of acute small intestine obstruction or localized symptoms referable to the lung or the diaphragm should be raved for suspected empyema and for abscess of the liver or a subphrenic abscess. The positive location of a pus pocket before operation greatly reduces the operative time and many abscesses can be drained under local anesthesia.

In cases of abdominal trauma invaluable aid is rendered by the x-ray. Unsuspected congenital hernia of the diaphragm and subdiaphragmatic abscess are two findings which in the author's experience have well repaid the use of the x-rays.

A rapidly growing ovarian cyst may so simulate pregnancy that it is well in suspicious cases to resort to the roentgen ray examination. A pregnant uterus can be diagnosed by film at four months, and by means of pneumoperitoneum the broadened isthmus can be detected at six or eight weeks. Sometimes the same observation can be made by means of inflation of the colon by gas.

The Value to the General Practitioner of X-Ray Examination of the Stomach and Duodenum. ADOLPH HENRIQUES, M. D., New Orleans M. & S. J. 76:368-370, February, 1924.

THE greatest difficulty in the way of determining the pressure abnormalities in the stomach is the lack of knowledge as to what is normal. This organ is subject to many variations of position and peristalsis, so much so that several months of special study of the normal stomach and its variations is requisite for any adequate knowledge of the normal and hence of the abnormal.

A preliminary fluoroscopic examination should be made, examining the esophagus, the chest and the duodenum. Each portion of the stomach should be examined as though it were a separate organ. The author prefers the use of the fluoroscope to the plate although plates of the gall-bladder region and of the terminal

ileum and the appendix and colon should be made. An opaque enema may or may not be necessary.

This sort of an examination will eliminate misdirected treatment in cases where the stomach and the duodenum are not at fault and on the other hand will lead to the recognition of an organic lesion where such exists.

Value of the Lateral Projection in the Roentgen Ray Examination of the Chest: With Special Reference to the Surgical Treatment of Abscess of the Lung. LEON T. LE WALD, M. D., and NATHAN W. GREEN, M. D., Arch. Surg. 8:265-292, January, 1924.

OBLIQUE projection is necessary for the study of foreign bodies in the respiratory tract and esophagus and it is indispensable in searching for lesions in the esophagus and in examination of the heart, aorta and mediastinal lymph nodes. However, in examining the lung for abscess the direct lateral position is far better. Opaque markers are attached by adhesive plaster to the anterior, posterior and lateral chest wall and later these regions are marked with indelible pencil to guide the surgeon in operation.

In the two-stage operation for abscess the method is valuable. In the first stage gauze is impregnated with an opaque substance such as iodoform and is packed into the wound. An anteroposterior and a lateral exposure is then made to determine the intervening distance between the gauze pack and the lung, thus any discrepancy can be observed and corrected.

The lateral exposure is also very valuable in the location of an encysted collection of pus between the lobes or in the pleural cavity. It is also valuable in cases of congenital or acquired hernia of the diaphragm, eventration of the diaphragm and in determining the relationship of abnormally displaced organs to the heart or to the diaphragm. In the localization or removal of foreign bodies the lateral exposure should never be omitted.

Enlarged Thymus. G. E. PFAHLER, M. D., Arch. Pediat. 41:39-46, January, 1924.

ENLARGED thymus is more common, this author believes, than is generally supposed. The symptoms of heavy breathing, wheezing, cyanosis or an abnormal cry should make one suspicious of thymic enlargement. Coughing or choking without apparent cause, flabby tis-

sues, obesity, lack of resistance to infections, eczema, convulsions and mental retardation are all symptoms found with an enlarged thymus. The therapeutic test is more reliable than x-ray diagnosis, however, as the pressure may be anteroposterior and the enlargement may not appear laterally.

X-ray or radium treatment is specific but it must be applied cautiously, accurately and skillfully. Radium is superior to x-ray, the author believes.

The location of the thymus is in the upper mediastinum and it extends downward to and overlaps the upper shadow of the aorta and heart, extending on both sides of the spine and bulging outward. It appears as a single shadow, wide below and continuous with the heart shadow. Lymphadenitis of the upper mediastinum resembles enlarged thymus of slight grade and in such a case diagnosis cannot be absolute. The technique for examination and treatment is given in detail.

Roentgen Ray Therapy in the Treatment of Exophthalmic Goiter. G. M. GOODWIN, M. D., W. B. LONG, M. D., Am. J. M. Soc. 177:38-54, January, 1924.

THE technique used upon the cases reported was as follows: Two-fifths of an erythema dose given on alternate sides of the neck each week on an area between the upper level of the thyroid and the upper level of the third rib. The patient lies upon the back, the target to skin distance is 35 cm. and the filter 3 mm. Al. Potential at the tube terminals is 140,000 voltage (peak) corresponding to a spark gap of ten inches between points. Five milliamperes used and time of exposure five minutes but the dose was reduced for highly toxic patients. In an experience of over five years there has been no sign of atrophy or telangiectasis in the nine cases treated with roentgen ray. In five of them the results of treatment have been satisfactory, in one the results are doubtful and in one no conclusion can be drawn because treatment was discontinued. In two others the toxemia seemed to increase in spite of prolonged treatment.

Roentgen Ray Therapy in Thyrotoxicosis: Its Effect as Measured by the Basal Metabolic Rate. J. MARION READ, M. D., California State J. Med. 22:10-14, January, 1924.

ALTHOUGH expressing some skepticism the author says that he is convinced that in some cases roentgen ray irradiation produces a marked and rapid reduction in the metabolic rate and that this is accompanied by general improvement. A period of three to six months is necessary for marked improvement or a return to normal. No patients were made worse by irradiation and no myxedemas or deaths occurred in the 50 patients treated with x-ray alone.

The Use of the X-Ray in the Diagnosis of Pulmonary Tuberculosis. RAY W. MATSON, M. D., Northwest Med. 23:9-15, January, 1924.

IN THE early diagnosis of pulmonary tuberculosis the x-ray is superior to physical diagnostic methods of the average practitioner. No two authors agree, however, as to what constitutes an early physical diagnosis of the disease.

The subject is discussed under the heads of the primary tubercle, latent tuberculosis, adult type of tuberculosis, chronic fibrocaceous tuberculosis, chronic quiescent fibrocaceous tuberculosis, unilateral pulmonary tuberculosis, chest deformities, peribronchial infiltrations, tuberculous and non-tuberculous bronchitis, acute types of tuberculosis, pleuritic exudates. The roentgenologic findings characteristic of each are discussed.

For the successful radiography of the lungs clinicians doing their own work should acquire a certain technique and adhere to that one. The physical examination should be made first, findings charted and a diagnosis determined upon before using the x-ray. The man who does otherwise will find that his physical diagnostic acumen will leave him and he will be incapable of making a physical diagnosis and hence will often be lead into a mistaken conclusion by the x-ray findings alone. "The x-ray is a valuable aid but it must be used in combination with carefully considered clinical history, a complete and thorough physical examination, supplemented by laboratory work and above all the man who interprets the roentgen shadows must know medicine and pathology."

Newer Physiology of the Skin: With Special Reference to the Action of Ultraviolet Light. C. GUY LANE, M. D., Arch. Dermat and Syph. 9:176-185, February, 1924.

NEITHER overenthusiastic upon the subject of ultraviolet therapy nor prejudiced against it the

author has this to say: "It is not a cure-all by any means, and we are undoubtedly in a period of over-enthusiasm as to its use, and many of the facts relative to its action and use are still a matter of conjecture. The fact remains, however, that ultraviolet light therapy has come to be a valuable method in the treatment of certain dermatological conditions."

Lupus vulgaris, capillary nevi and roentgen ray telangiectasis, some cases of chronic eczema, some cases of acne, sinuses of tuberculous origin, some cases of erythema induratum and of alopecia areata, also pityriasis rosea and psoriasis are more or less amenable to ultraviolet treatment. In acne, however, the author believes that x-ray radiation gives more permanent results.

The Roentgen Ray in the Treatment of Skin Diseases. HOWARD FOX, M. D., Arch. Dermat. & Syph. 9: 13-37, January, 1924.

VERSATILE as is the roentgen ray it is not a panacea for all skin diseases and should not be used to the exclusion of other remedies. The author warns his readers that in all except malignant cases every precaution should be taken to avoid an erythema.

His conclusions are based upon the results of his private practice but aside from these original observations the paper contains valuable citations of the observations and conclusions of other prominent workers in the field of dermatology.

With modern apparatus the roentgen ray can be accurately measured and safely employed. It is the best local remedy for the routine treatment of acne vulgaris, eczema, seborrheic dermatitis and lichen planus but is unsatisfactory in rosacea except for a favorable effect upon the acne-like lesions. It should be used with great caution in psoriasis, and then only upon selected cases. Its action in ringworm and favus of the scalp is brilliant but care must be exercised because if too great an amount of irradiation is given alopecia will result, and if too small an amount is given epilation will not result and consequently the disease will not be cured. In some of the infectious granulomas it is of great value. Together with radium it holds a unique position in its ability to check mycosis fungoides. In certain diseases characterized by verrucous lesions the roentgen ray is of greater or less value. In plantar warts it is the method of choice. In anal and vulvar pruritis it is pal-

liative and in localized hyperhidrosis it is curative. Alone or in conjunction with surgery it is the best treatment for keloid. In lupus erythematosus it is of little or no value and in hypertrichosis its use is in general contra-indicated. Lichen nitidus and lingua geographica are less common diseases where the rays are of value. Among malignant diseases the basal-cell epithelioma is most amenable to treatment by the roentgen rays and the best results are obtained when used in conjunction with curettage.

Radium in Dermatology. O. H. FOERSTER, M. D., Arch. Dermat. & Syph. 9:38-50, January, 1924.

THE physics, biophysics and biochemistry of the subject are discussed in the first four pages of this article. The rest of the paper deals with the indications for radium in basal-cell, squamous-cell and prickle-cell epithelioma, keratoses, keloids, vascular nevi, angioma cavernosum, lupus erythematosus, lupus vulgaris, ulcers and lichenified eczema. Generally speaking, radium holds a prominent and sometimes a superior place in dermatological therapy.

A New Technique in Radium Therapy. W. HERBERT BROWN, M. D. and JOHN P. MCHUTCHINSON, B. Sc., M. A., Lancet. 206:309, February 9, 1924.

THIS communication reports the preparation of the later disintegration products of radium without the more active members of the emanation series in such form as to be used for superficial nevi of the telangiectatic type and for lupus erythematosus. A very definite reaction occurs within a short time, a final pallor being obtained within ten days in the case of a nevus and an apparently healthy area of natural color in an intractable lupus erythematosus.

So far the results are most encouraging. At a later date the authors plan to make a full report of the processes involved in the treatment and to report the clinical results in full.

Ultraviolet Ray Therapy in Dermatology. JOHN BUTLER, M. D., Arch. Syph. 9:51-66, January, 1924.

OPINIONS are at variance as to the value of ultraviolet rays in eczema, infectious eczematized dermatitis, pruritis, lichen simplex chronicus, sycosis vulgaris and furunculosis.

Too many overenthusiastic and even untruthful statements have been

made by both those who are treating with these rays and by the commercial houses selling apparatus. The result has been to create unqualified condemnation of this form of therapy by some men who have tried some form of treatment too enthusiastically recommended to them. Other men, however, have applied the rays, using their best judgment, and these are the men who are proving or disproving their value as regards certain dermatoses.

The author's conclusions are drawn partly from his own practice, partly from results secured by others quoted in the article. He has listed the results in lupus vulgaris as inconclusive; lupus erythematosus, disappointing; acne vulgaris, better results than from any other method; roentgen ray telangiectasis, successful; alopecia areata, good; parakeratosis variegata, good; in granuloma pyogenicum, erythema pernio and keratosis pilaris, results were gratifying.

Radium in the Treatment of Vascular Nevi. FRANK EDWARD SIMPSON, M. D., Surg. Gynec. Obst. 38: 407-411, March, 1924.

WITHIN the last ten years the author has treated with radium more than 300 cases of vascular nevi and he believes that radium is the best treatment for most such cases.

It is unwise, in his opinion, to allow nevi to remain untreated as they are always potentially malignant.

There are advantages and disadvantages in radium treatment of these lesions. The advantages are that radium acts on the blood vessels of the nevus, other tissues being injured but slightly if at all. There is very little scar tissue following radium treatment if the application has been properly done and contractions seem never to occur. Radium is painless in this form of treatment and cosmetic results are better than from any other method. The cosmetic results depend largely upon fidelity to detail of treatment. Another advantage is that sometimes, as in the case of an infant unable to use the lips in nursing, the prompt use of radium will save life.

The disadvantages are that radium is expensive and in some cases is slow and tedious. A recurrent dermatitis may persist for years in some cases where treatment produced a sharp inflammatory effect and was followed by an atrophic skin. In other cases the skin may be too white or telangiectasis may develop. In others the site of the nevus may be

slightly depressed. There may result an increased tendency to freckling. In many cases none of these untoward results will appear if treatment has been carefully given. The author gives some points in technique but refers his readers to his book, *Radium Therapy*, for specific technique.

X-Ray a Valuable Agent in the Treatment of Skin Diseases. COSBY SWANSON, M. D., J. M. A. Georgia, 13:16-20, January, 1924.

IN THE treatment of skin diseases by x-ray it is usually necessary to use the rays in combination with other forms of treatment.

In certain types of acne vulgaris x-ray is more valuable than any other mode of treatment but it is not suitable for all types. In the erythematous type it is of but little value; this type as a rule is due to some menstrual disturbance. Neither is it of value in acne due to toxemia unless the primary infection is removed. The cases most benefited are those chronic types in which the patient has an oily skin but is in good health. A sufficient amount of x-ray should be given to decrease the activity of the sebaceous glands without affecting the texture of the skin. The author gives one-fourth of a skin unit every seven days until the acne disappears, which usually requires from eight to ten treatments. In acne indurata the results will be better if the filter technique of Witherbee and Remer is used.

All types of rosacea are benefited but the best results are obtained in early cases. The same technique is used as for acne although more x-ray is tolerated. Internal medication, dietary regulation and mild drying lotions are used in combination with the rays.

In eczema, whether acute or chronic, the total treatment should not exceed the erythematous dose and stimulating drugs such as tar, sulphur, resorcin, salicylic acid and mercury should never be used.

Chronic seborrheic eczema is benefited by x-ray but it is of little value in acute cases. The chronic cases will require large doses of three-fourths to one skin unit every two or three treatments and, sometimes, a few months later another course of treatments will be found necessary.

In cases of parasitic eczema which do not respond and which show no improvement after four to six treatments, it is better to discontinue the rays. The lesions on the hand, wrists and feet (not between the toes), respond the best, the body areas do not respond as well.

Psoriasis is a stubborn lesion and is prone to recur but x-ray treatment is the most efficacious form of treating it that the author has yet found. However, if the lesions do not respond after four fractional doses he discontinues the ray treatment. If recurrences are treated by x-ray then great precautions are necessary to avoid a chronic x-ray dermatitis.

Internal medication is the first treatment that should be tried for hyperhidrosis but if systemic treatment fails to influence the condition then x-ray treatment is permissible and by producing partial atrophy of the sweat glands will relieve the condition. Five to eight fractional doses every seven to ten days are given but if erythema results then x-ray treatment must be discontinued.

If internal medication and surgery has failed in a case of furunculosis then x-ray treatment is of value and is of the most value in those lesions which are located in the axillae, groins and back of the neck. A filter should be employed (no specific filter mentioned).

Sycosis whether of the parasitic or pyogenic type can be cured in less than half the time usually required if the rays are used in combination with other forms of treatment.

Bone-Free Radiographs: An Advance in the Photography of Small Fragments in the Eye. T. HARRISON BUTLER, M. D., Proc. Roy. Soc. Med., Sect. Ophthal. 17:6, January, 1924.

PROFESSOR VOGT of Zurich has elaborated the method, originated by Sir James Mackenzie Davidson, for obtaining bone-free photographs. By means of this simple method it is easy to obtain a clear picture of the smallest metallic fragment of bone, stone, and lead-free glass if situated in the anterior part of the eye.

The technique is as follows: "An oval dental plate is pressed in between the eye and the internal margin of the orbit as far as the patient

will permit without too much discomfort. The tube is located laterally on the outside and somewhat behind. An exposure of three seconds with a soft tube is sufficient. A second exposure is made with another plate that is inserted above the eye, the tube being below." The patient lies with the head overhanging the edge of the table, the tube being brought above him. A little practice enables one to obtain the right position. The method is routine at the Birmingham Eye Hospital and the Coventry Hospital and has been found very useful.

Preliminary Note on the X-Ray Treatment of Interstitial Keratitis. H. HOWARD BYWATER, M. D., and F. C. PLUMER, M. D., British M. J. 2:11-52, December, 15th.

SEVERAL cases are reported and all received the usual treatment for interstitial keratitis during the course of x-ray treatments. Results from these cases were so pleasing that the authors plan to continue using the method.

Dosage consisted of "Five minutes exposure once weekly; 5 inch spark gap; 1 ma.; 9 inches from anticathode to eye, filtered through 1/2 mm. Al and 2 felts."

Roentgen Treatment of Uterine Carcinoma. By HERMANN WINTZ, Ph. D., M.D., Erlangen. Octavo. Cloth. \$5.40, George Thieme, Publisher, Leipzig, Germany, 1924.

THE author's views regarding the principles of deep therapy of uterine carcinomas are given in the thirty pages of text, together with discussions of technique. The text is followed by 50 plates illustrating the technique in use at Erlangen. Each plate is accompanied by an explanatory paragraph.

The author's principle of treatment is that 90 per cent of the ESD is the minimum dose and 110 ESD is the maximum dose with which to combat the usual carcinoma, and that three phases of treatment must be considered, namely, (1) destruction of the malignant cells, (2) removal of the destroyed cells, (3) restitution of sound tissue.

Accuracy of technique, due consideration of the patient, and adequate after care and treatment are necessary factors in securing successful results.

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